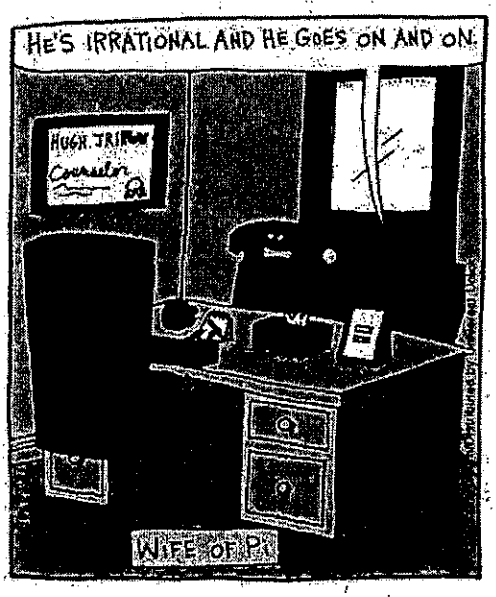
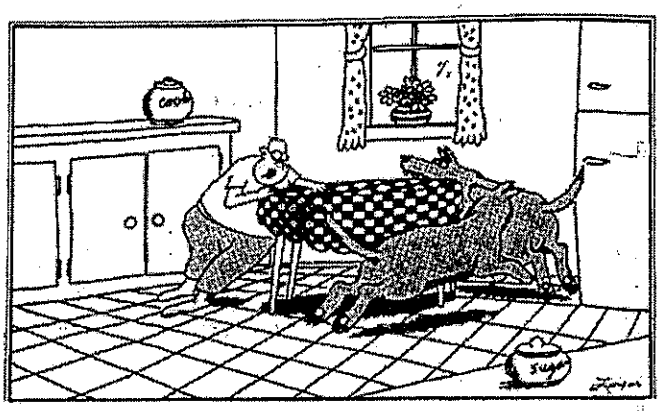
MATH 9 YEAR END

REVIEW

NAME: Key





Luposlipaphobia: The fear of being pursued by timber wolves around a kitchen table while wearing socks on a newly waxed floor.

$$\sqrt{-1} \quad 2^3 \quad \Sigma \quad \pi$$

and it was delicious!

Year End Review Notes and Practice

1. Number Systems

Symbol	Name	Includes	Doesn't Include
N	Natural	1, 2, 3 ...	zero, negatives, fractions, decimals
W	Whole	0, 1, 2, 3 ...	negatives, fractions, decimals
I	Integer	... −2, −1, 0, 1, 2 ...	fractions, decimals
Q	Rational	All of above plus terminating & repeating decimals	irrational
$\overline{Q}$	Irrational	non-terminating non-repeating decimals	rationals
R	Real	all #s other than imaginary	imaginary e.g. $\sqrt{-1}$

2. Square Roots

Key words: square numbers, perfect squares, non-perfect squares, benchmarking

Find the square root of the following numbers-show benchmarking to approximate the square root if it is not a perfect square.

$\sqrt{49}$

$= 7$

$\sqrt{68}$

$\sqrt{64}$ $\quad$ $\sqrt{81}$

8 $\quad$ 8.3 $\quad$ 9

$\sqrt{\frac{36}{81}}$

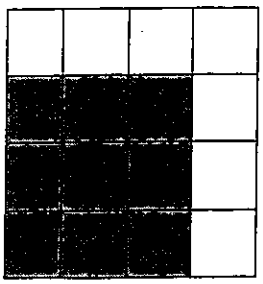
$= \frac{6}{9} \rightarrow \frac{2}{3}$

square root of 0.32

$\sqrt{0.25}$ $\quad$ $\sqrt{0.36}$

0.5 $\quad$ 0.57 $\quad$ 0.6

Express the square root of this perfect square as a fraction.



$\frac{3}{4}$

A square has an area of 5.76 cm^2.

What is the side length of the square?

$\sqrt{5.76} = 2.4\,cm$

What is the perimeter?

$2.4 \times 4 = 9.6\,cm$

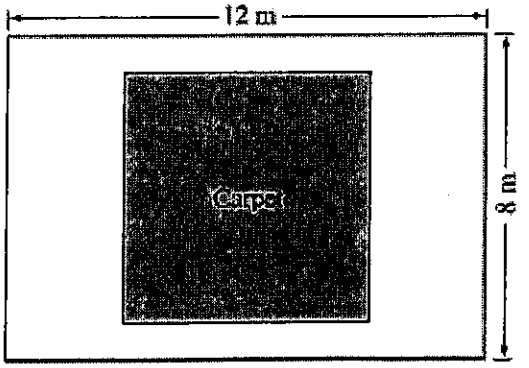
✗	✗	✓	✓	✓	✓	✗	✗
$\sqrt{51}$	$\sqrt{55}$	$\sqrt{61}$	$\sqrt{66}$	$\sqrt{71}$	$\sqrt{77}$	$\sqrt{81}$	$\sqrt{88}$
7.14	7.42	7.81			8.77	9	9.38

How many of the square roots shown above have a value that is between 7.8 and 8.8?

$\sqrt{60.84}$ $\sqrt{77.44}$

A. 2
B. 3
C. 4
D. 5

A square carpet covers 37.5% of the floor area of a rectangular room, as shown below.



96×0.375

$36\,m^2$ area

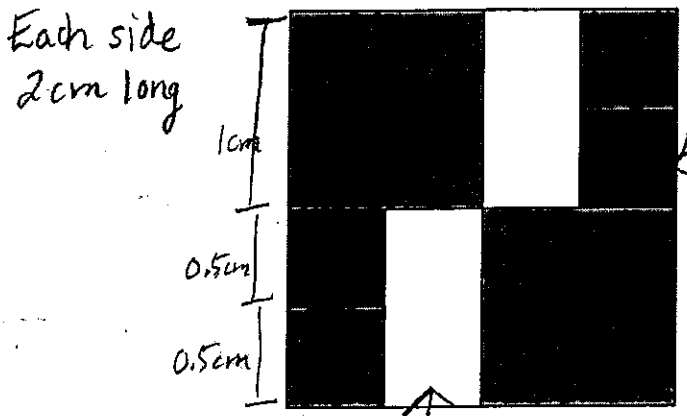
$\sqrt{36}$

$= 6\,m$

What is the side length of the carpet shown above?

A. 7 m
B. 6 m
C. 5 m
D. 4 m

The diagram shown below is a square and has a perimeter of 8 cm.



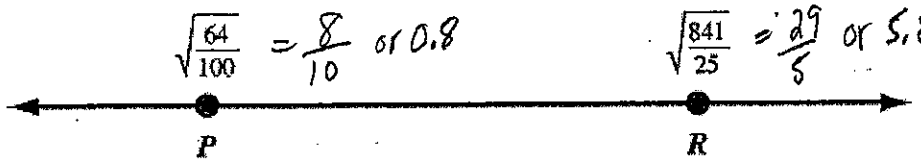
Numerical Response

What is the **total** area of the white rectangles and the black squares?

Answer: 1.5 cm²

1 + 0.5 = 1.5 cm²

The square roots of two rational numbers are represented on the number line shown below.



If Q is located between points P and R on the number line above, then which of the following square roots could **not** represent Q?

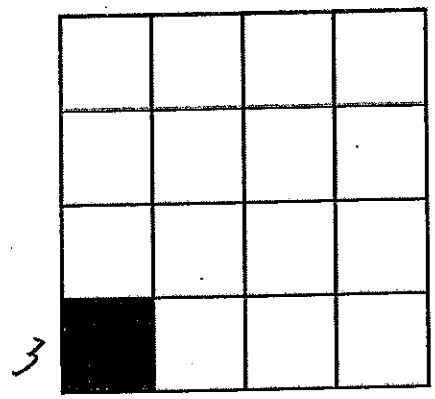
A. $\sqrt{\frac{324}{81}}$ $\frac{18}{9}$ or 2 ✓

B. $\sqrt{\frac{256}{9}}$ $\frac{16}{3}$ or $5.\overline{3}$ ✓

C. $\sqrt{\frac{225}{64}}$ $\frac{15}{8}$ or 1.875 ✓

D. $\sqrt{\frac{169}{4}}$ $\frac{13}{2}$ or 6.5 ✗ ← Too big

The squares of the grid below are identical. The area of the shaded square on the grid is 9 units^2.



12 by 12 sides

12 x 4 sides
= 48

$\sqrt{9}$

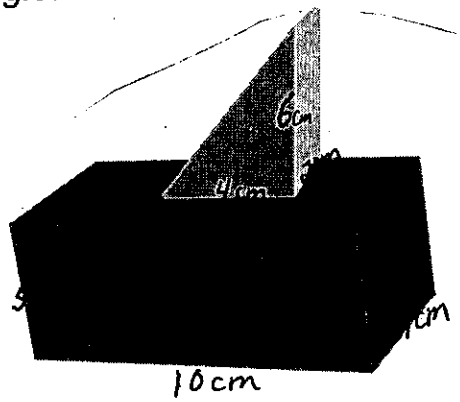
Numerical Response

The perimeter of the grid shown above is 48 units.

3. Surface Area of Composite Shapes

The sum of the area of each of the surfaces of the object that make up the composite object MINUS the overlap

Rectangle: A = lw Circle: $A=\pi r^2$ Triangle: $A=\frac{bh}{2}$ Cylinder: $A= 2\pi r^2 + 2\pi rh$



Rectangular prism

Bottom & top lW x 2
10(4) x 2
40 x 2
= 80

ends lW x 2
5(4) x 2
20 x 2
= 40

sides lW x 2
10(5) x 2
50 x 2
= 100

Triangular prism

* Bottom to subtract lW
4(2)
= 8

right side lW
6(2)
= 12

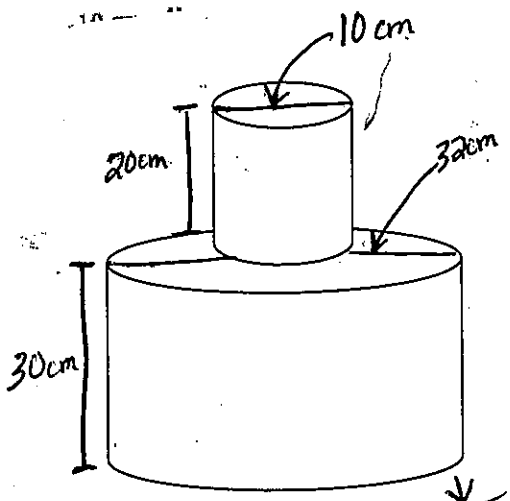
triangular sides $\frac{bh}{2}$ x 2
$\frac{4 \times 6}{2}$ x 2
= 24

left side lW
7.2(2)
= 14.4

$a^2+b^2=c^2$
$6^2+4^2=c^2$
$36+16=c^2$
$\sqrt{52}=c^2$
$7.2=c$

Total SeA $\Rightarrow 80+40+100+12$
$24+14.4-8$
* = 262.4 cm^2

The following shape needs to be painted. If one can of paint covers 200cm^2 and each can costs $12, how much will it cost to paint the shape? (No need to paint the bottom.)



Small cylinder

$A_{top} = \pi r^2$
$= 3.14(5)^2$
$= 3.14 \times 25$
$= \boxed{78.5}$

$A_{tube} = \pi dh$
$= 3.14(10)(20)$
$= \boxed{628}$

large cylinder

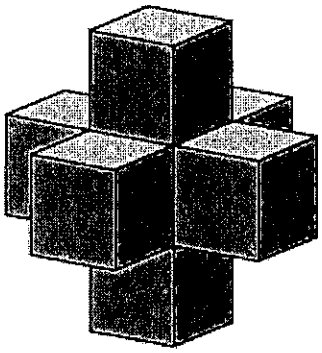
$A_{top} = \pi r^2$ – area circle small circl
$= 3.14(16)^2 - 78.5$
$= 3.14(256) - 78.5$
$= 803.84 - 78.5$
$= \boxed{725.34}$

$A_{tube} = \pi dh$
$= 3.14(32)(30)$
$= \boxed{3014.4}$

S.A. $= 78.5 + 628 + 725.34 + 3014.4$
$= 4446.24$ cm^2

4446.24 ÷ 200 → 22.2312 cans → 23 × $12.00 = $276.00

The following 3-D object is composed of identical cubes. The volume of the 3-D object is 56 cm^3.



$V_{cube} = lwh$

7 cubes

$7 \times ? = 56$

*volume of each cube must be 8

$\sqrt[3]{8}$
$= 2$

length 2
width 2
height 2

Area of one face is 2×2
$= 4$ cm2

30 exposed faces

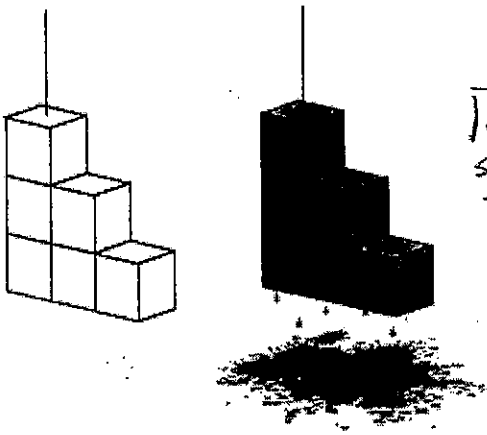
30×4
$= 120$ cm^2

The surface area of the 3-D object above is

A. 30 cm^2
B. 60 cm^2
C. 120 cm^2
D. 144 cm^2

A 3-D object made of 2 cm × 2 cm × 2 cm cubes is dipped in paint.

Unpainted Object **Painted Object**



12 unpainted surfaces.

Area of one face
$2 \times 2 = 4$
4×12 surfaces
$= 48$

If the painted object is separated into individual cubes, then the total area of the **unpainted** surfaces will be

A. $12\ cm^2$
B. $24\ cm^2$
C. $32\ cm^2$
D. $48\ cm^2$

9A hw

4. Powers and Exponent Laws

Key words: power, base, exponent

Exponent	Expanded	Standard
4^5	$4 \times 4 \times 4 \times 4 \times 4$	1024
$\left(\frac{2}{3}\right)^3$	$\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3}$	$\frac{8}{27}$
$(-3)^2$	-3×-3	9
-3^2	$-(3 \times 3)$	-9
16^0	$16 \div 16$	1
$(-8)^3$	$-8 \times -8 \times -8$	-512
-4^6	$-4 \times 4 \times 4 \times 4 \times 4 \times 4$	-4096
$(-3)^4$	$-3 \times -3 \times -3 \times -3$	81

Multiplying Exponents
If you have like bases and you are multiplying, add exponents

Simplify each of the following:

$3^4 \times 3^6$ 3^{10}

$(-2)^4 (-2)^3 (-2)$ $(-2)^8$

$(9a^2b^3)(-3a^4b)$ $-27a^6b^4$

Dividing Exponents
If you are dividing like bases, subtract exponents

Simplify each of the following:

$3^7 \div 3^6$ 3

$(2)^4 \times (2)^7 \div (2)^9$ $2^{11} \div 2^9 = 2^2$

$\left(\frac{5^6 \times 5^3}{5^4 \times 5}\right)$ $\frac{5^9}{5^5} = 5^4$

$\left(\frac{30a^5b^4c^3}{6ab^4c^2}\right)$ $5a^4c$

Power Raised to a Power
The exponent outside the brackets multiplies into the exponent inside the brackets

Simplify each of the following:

$(6^4)^3$ 6^{12}

$(-2^7)^4$ $(-2)^{28}$

$(6^3)^0$ 6^0

$\left((3^4)^3\right)^2$ 3^{24}

$\left(\frac{2^3}{3^2}\right)^4$ $\frac{2^{12}}{3^8}$

$\left(\frac{4^7 \times 4^3}{4^8}\right)^2$ $\left(\frac{4^{10}}{4^8}\right)^2 = (4^2)^2 \rightarrow 4^4$

Simplify then evaluate each expression:

$\frac{\left[(3^5)(3^2)\right]^2}{(3^4)^3} = \frac{(3^7)^2}{3^{12}} \rightarrow = \frac{3^{14}}{3^{12}} = 3^2 = 9$

$2^3 \times 2^2 - 2^0 + 2^4 \div 2^3$
$= 2^5 - 2^0 + 2^1$
$= 32 - 1 + 2$
$= 33$

Base Ten Numbers

Write 805 076 using powers of 10.

$8 \times 10^5 + 5 \times 10^3 + 7 \times 10^1 + 6 \times 10^0$

$x^6 \div x^4$

If $(x^3)^2 \div x^4 = 144$, then what is the whole number value of x?

x^2

Answer: 12

$x^6 \div x^4 = 144$

$\sqrt{x^2} = \sqrt{144}$ $\quad x = 12$

Which of the following expressions represents the addition of 7^2 and 7^3?

$7 \times 7 + 7 \times 7 \times 7$

A. $(7+7)^{2+3}$

B. $(7+7)^{2\times 3}$

C. $(7 \times 7) + (7 \times 7 \times 7)$

D. $(7+7) \times (7+7+7)$

The expression $\left(\frac{(n^3)^4}{n^2}\right)(n^{10} \div n^5 \times n^2)$ can be simplified to the form n^p.

The value of p is

$\left(\frac{n^{12}}{n^2}\right)(n^5 \cdot n^2)$

$(n^{10})(n^2)$

n^{17}

A. 20

B. 17

C. 14

D. 13

Which of the following sets of powers is arranged in order of increasing value from left to right?

A $-2^2, -1^2, (-1)^2, (-2)^2$ (−4, −1, 1, 4)

B. $(-2)^2, (-1)^2, -1^2, -2^2$ (4, 1, −1, −4)

C. $-1^2, (-1)^2, -2^2, (-2)^2$ (−1, 1, −4, 4)

D. $(-1)^2, -1^2, -2^2, (-2)^2$ (1, −1, −4, 4)

The simplifications of two different expressions are shown below.

Expression X	Expression Y
$(3^2)^3 - 4^4 + 4^2 \times (-5)^2$	$2^6 \div 2^2 + (-5^2) \times 3$
$= 3^6 - 4^4 + 4^2 \times (-5)^2$	$= 2^3 + (-5^2) \times 3$
$= 729 - 256 + 16 \times 25$	$= 8 + (-25) \times 3$
$= 729 - 256 + 400$	$= 8 + (-75)$
$= 873$ ✓	$= -67$ ✗

Which of the following statements about the simplifications above is true?

A. The simplifications of both expressions are correct.

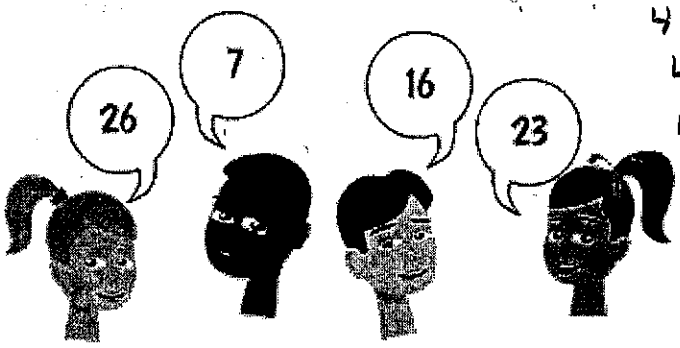
B. The simplifications of both expressions are incorrect.

C. The simplification of Expression X is correct and the simplification of Expression Y is incorrect.

D. The simplification of Expression Y is correct and the simplification of Expression X is incorrect.

Each of the four students shown below simplifies the following expression.

$$4 + 3 \times 5 - 6^4 \div (4 + 2)^3 \times 2$$



$4+15-1296 \div 6^3 \times 2$
$4+15-1296 \div 216 \times 2$
$4+15-6 \times 2$
$4+15-12$
$19-12$
$= 7$

Which student correctly simplified the expression?

A. Student 1

B. Student 2

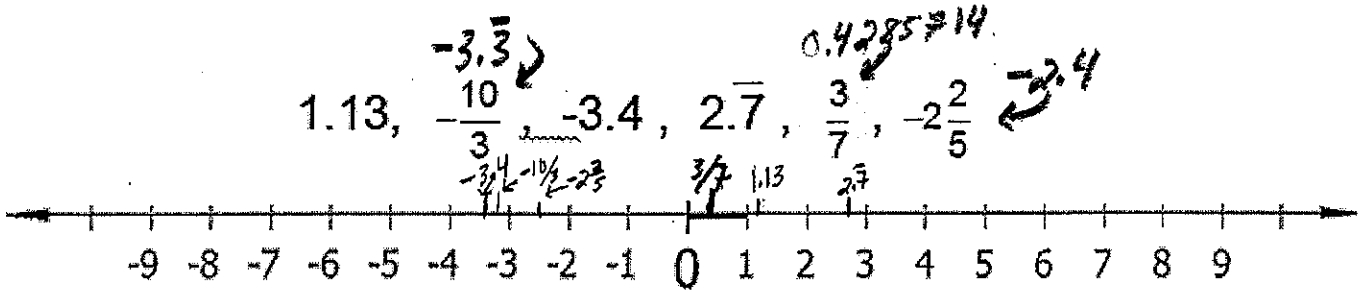
C. Student 3

D. Student 4

5. Rational Numbers

Place the following values on the number line. You can either work in fractions or convert into decimals.

$1.13,\ -\frac{10}{3},\ -3.4,\ 2.\overline{7},\ \frac{3}{7},\ -2\frac{2}{5}$



Adding/Subtracting Rational Numbers

-find common denominator
-work in IMPROPER FRACTIONS it's usually less confusing
-all answers should be changed into MIXED FRACTIONS if improper and all answers must be REDUCED!

$\frac{6}{8}+\frac{3}{5}$

$\frac{30}{40}+\frac{24}{40}$

$=\frac{54}{40} \rightarrow 1\frac{14}{20} \rightarrow \boxed{1\frac{7}{20}}$

$1\frac{2}{3}-\frac{3}{4}$

$\frac{5}{3}-\frac{3}{4}$

$\frac{20}{12}-\frac{9}{12}$

$=\boxed{\frac{11}{12}}$

$\left(2\frac{1}{4}\right)+\left(-3\frac{2}{6}\right)$

$\frac{9}{4}+\frac{-20}{6}$

$\frac{27}{12}+\frac{-40}{12}$

$=\frac{-13}{12} \rightarrow \boxed{-1\frac{1}{12}}$

$\left(-3\frac{1}{2}\right)+\left(\frac{5}{3}\right)-\left(1\frac{3}{4}\right)$

$\frac{-7}{2}+\frac{5}{3}-\frac{7}{4}$

$\frac{-42}{12}+\frac{20}{12}-\frac{21}{12}$

$=\frac{-43}{12} \rightarrow \boxed{-3\frac{7}{12}}$

Multiplying/Dividing Rational Numbers

-change to improper if mixed
-for multiplication, multiply straight across
-for division, change the sign to multiplication and take the reciprocal (flip) the fraction that follows

Solve each of the following showing all work.

$\frac{2}{5} \times \left(1\frac{2}{3}\right)$

$\frac{2}{5} \times \frac{5}{3}$

$= \frac{10}{15} \rightarrow \boxed{\frac{2}{3}}$

$\frac{2}{3} \div \frac{4}{5}$

$\frac{2}{3} \times \frac{5}{4}$

$= \frac{10}{12} \rightarrow \boxed{\frac{5}{6}}$

$3\frac{1}{2} \times \frac{-2}{4} \div -1\frac{3}{5}$ ← $\frac{-8}{5}$

$\frac{7}{2} \times \frac{-2}{4} \times \frac{-5}{8}$

$= \frac{70}{64} \rightarrow 1\frac{6}{64} \rightarrow \boxed{1\frac{3}{32}}$

Evaluate the following (remember BEDMAS rules)

$1\frac{1}{4} - \left(\frac{-2}{4} + 3\right)\left(\frac{2}{3} \times -\frac{1}{2}\right)$

$= \frac{5}{4} - \left(-\frac{2}{4} + \frac{3}{1}\right)\left(-\frac{2}{6}\right)$

$= \frac{5}{4} - \left(-\frac{2}{4} + \frac{12}{4}\right)\left(-\frac{2}{6}\right)$

$= \frac{5}{4} - \frac{10}{4} \cdot \frac{-2}{6}$

$= \frac{5}{4} - -\frac{20}{24}$

$= \frac{30}{24} - -\frac{20}{24}$

$= \frac{50}{24} \rightarrow 2\frac{2}{24} \rightarrow \boxed{2\frac{1}{12}}$

The temperature at 4:00 pm was 2 °C. The temperature drops 1.3 °C each hour. What will the temperature be at 11:00 pm?

$4 \rightarrow 11 = 7$ hours

$7 \times 1.3 = 9.1$ degrees dropped

$2 - 9.1 = \boxed{-7.1\,°C}$

A scientific calculator has 40 buttons, of which $\frac{1}{4}$ are white, $\frac{1}{5}$ are grey, and 4 are orange. The rest of the buttons are black.

Numerical Response

How many black buttons does the calculator have?

Answer: 18

$\frac{1}{4} \times 40 = 10$ white

$\frac{1}{5} \times 40 = 8$ grey

$+ \quad 4$ orange

22 buttons

$40 - 22 = 18$ Black

Connie buys a horse for $750 (including GST). She considers the two payment plans shown below.

Plan 1 Pay $150 now and $25 each month
Plan 2 Pay $200 now and $55 each month

How many **fewer** monthly payments could Connie make if she selects Plan 2?

A. 10
B. 14
C. 20
D. 24

Let n be # months to pay

#1

$150 + 25n = 750$
$-150 \quad -150$

$\frac{25n}{25} = \frac{600}{25}$

$n = 24$ months

#2

$200 + 55n = 750$
$-200 \quad -200$

$\frac{55n}{55} = \frac{550}{55}$

$n = 10$ months

$24 - 10 = 14$

Patricia wants to buy a new pair of ice skates that cost $250 including GST. She already has $86 she plans to use towards this purchase. She earns $10.25/hour at her part-time job.

Numerical Response

What is the minimum number of hours that she must work to save enough money to purchase the pair of ice skates?

Let n = # hours minimum

$86 + 10.25n = 250$
$-86 \quad -86$

$\frac{10.25n}{10.25} = \frac{164}{10.25}$

$n = 16$

16 hours minimum

Emily's cellphone plan charges her $0.05 per text message, $0.06 per minute of voice usage and a $5.00 base fee each month.

What is Emily's cellphone bill if she sent 33 text messages and talked for 47 minutes in one month?

A. $5.11
B. $6.65
C. $7.82
D. $9.47

$5 + 33(0.05) + 47(0.06)$
$= 5 + 1.65 + 2.82$
$= \$9.47$

6. Linear Relations

Keywords: linear relation interpolation extrapolation

Here a pattern made with tooth picks. The pattern continues

Figure 1 Figure 2 Figure 3

Write an equation that relates the number of toothpicks, T, to the figure number, n.

Figure # (n)	Toothpicks (T)
1	5
2	9
3	13
4	17
5	21

+1 +4

$T = 4n + 1$

a. How many toothpicks will be needed for figure 17?

$T = 4(17) + 1$

$T = 68 + 1$

$\boxed{T = 69}$

b. Which figure number uses 213 toothpicks?

$213 = 4n + 1$

$-1 \quad -1$

$\frac{212}{4} = \frac{4n}{4}$

$\boxed{53 = n}$

Find the pattern.

x	y
-2	7
-1	4
0	1
1	-2
2	-5

+1 −3

Relationship: $\boxed{y = -3x + 1}$

If x = 7: $y = -3(7) + 1$

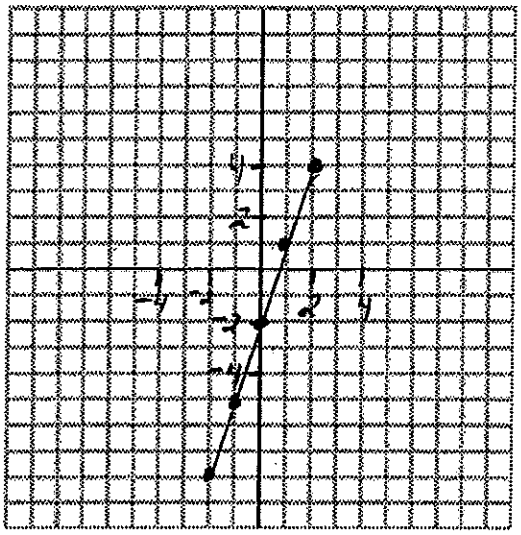
$y = -21 + 1$

$\boxed{y = -20}$

Graph the relationship.

$y = 3x - 2$

x	y
2	4
1	1
0	-2
-1	-5
-2	-8



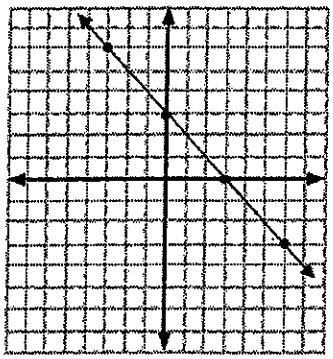
The 3 graphs below have these equations. Match each graph to the equation which describes it:

$y = 3x + 3$ Graph C

$x + y = 3$ Graph A $y = -x + 3$

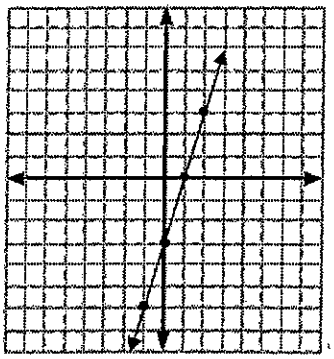
$y = 3x - 3$ Graph B $y = 3x - 3$

Graph A



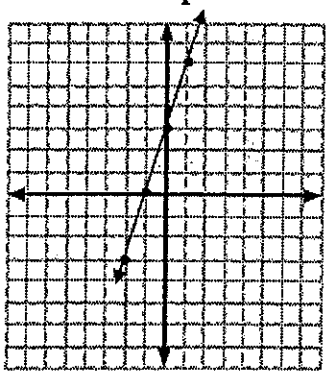
$x + y = 3$

Graph B



$y = 3x - 3$

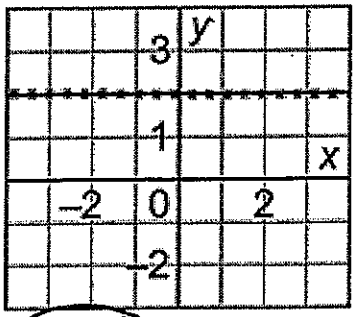
Graph C



$y = 3x + 3$

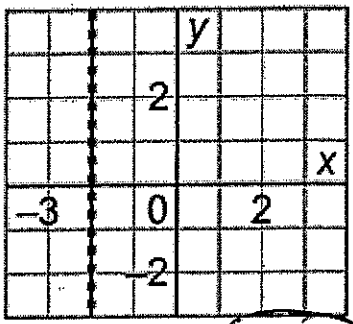
Which equation describes each graph?

a)



$y = 2$ or $x = 2$

b)



$y = -2$ or $x = -2$

INTERPOLATION: reading data INSIDE the graph between data points
EXTRAPOLATION: making predictions OUTSIDE the data points (this is a prediction based on the current trends)

The graph shows how the cost of a long distance call changes with the time for the call.

a) Estimate the cost of a 7-min call.
Is this interpolation or extrapolation? Explain.

$0.62 interpolation

* Between given data points

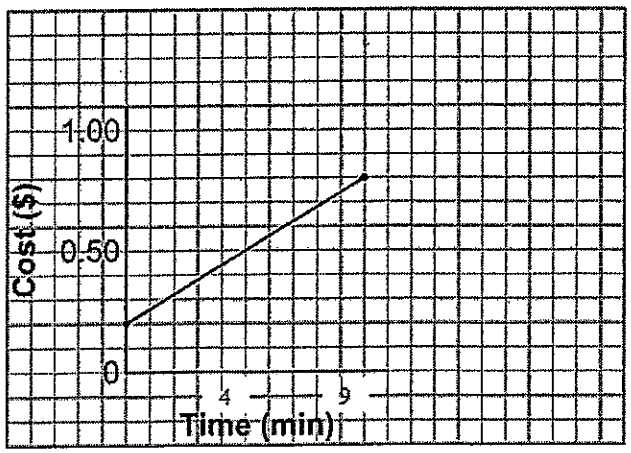
b) The cost of a call was $1.00. Estimate the time for the call.

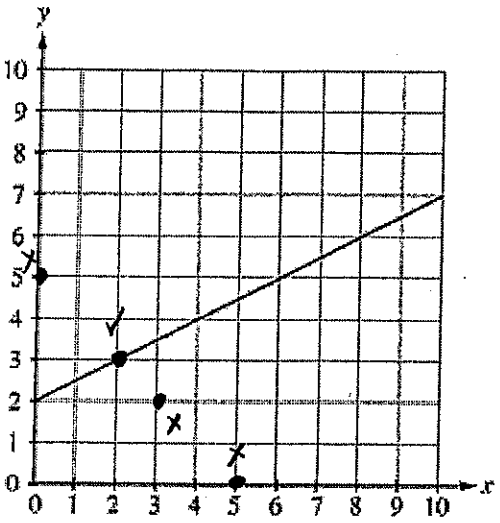
13 minutes
extrapolation
* beyond given data points

c) The cost of a call was $1.50. Estimate the time for the call.

21 minutes

Cost of Long Distance Calls

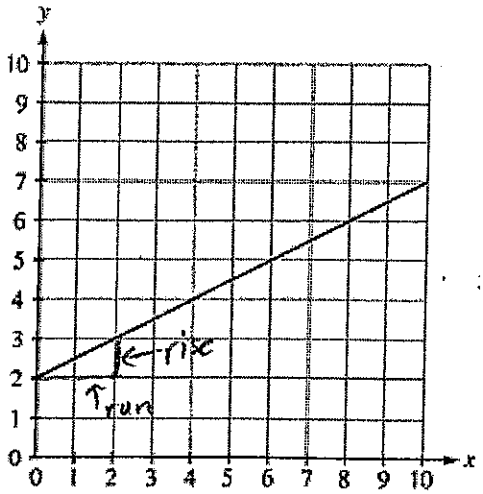




The line created by the relation $y = 5 - x$ will intersect the line shown on the graph above at

x	y	
0	5	x
2	3	✓
3	2	x
5	0	x

A. (0, 5)
B. (5, 0)
C. (2, 3)
D. (3, 2)



$y = mx + b$

y intercept is 2
positive slope $\frac{1}{2}$

The equation representing the linear relation on the graph shown above is

x	y
0	2
2	3
4	4

A. $y = 0.5x + 2$
B. $y = 0.5x - 2$
C. $y = 2x + 4$
D. $y = 2x - 4$

7. Polynomials

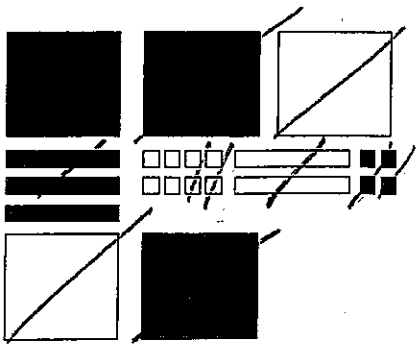
Key Words:

Polynomial: a term (or terms) whose variable(s) have whole number exponents
Terms: separated by addition/subtraction signs (monomials, binomials, trinomials) -
e.g. 2x + 3 is a binomial
Coefficient: the number multiplied by a variable in a term
e.g. 4a (4 is the coefficient)
Variable: an unknown that is represented by a letter e.g. 7n (n is the variable)
Constant: a value that does not change (# without a variable)
e.g. 4a + 2 (2 is the constant)
Degree: the exponents added together in a term
-if more than one term, the term with the highest degree is used to represent the total polynomial e.g. $3x^2y + 10x^2 - y$ (this is a third degree polynomial)

	Terms	Coefficient	Variable	Constant	Degree
$-8y$	monomial	-8	y	none	1st
12	monomial	none	none	12	zero
$-2b^2 - b + 10$	trinomial	-2 & -1	b	10	2nd
$-4 - b$	binomial	-1	b	-4	1st

What does each of the following algebra tiles represent?

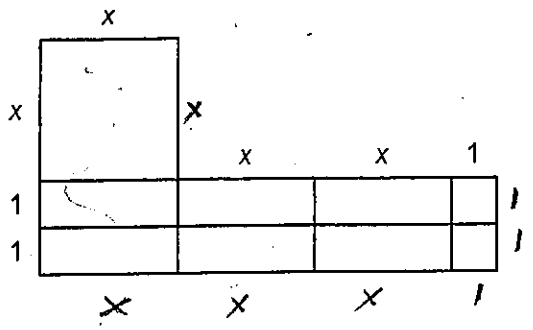
$3x^2 + 3x + 2$



$x^2 + x - 4$

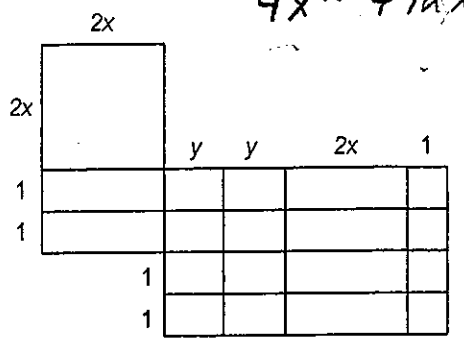
Write a polynomial to represent the tiles and the perimeter of each shape.

x^2+6x+2



Perimeter $= 8x+6$

$4x^2+12x+8y+4$



Perimeter $= 12x+4y+10$

Adding and Subtracting Polynomials

-group polynomials together and collect like terms (same variables/same exponents)

$(5x^2-9x-4) + (2x^2-3x-5)$

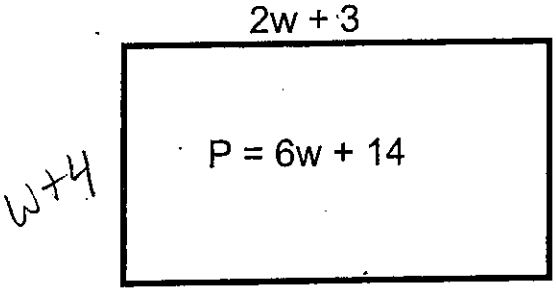
$7x^2-12x-9$

$(5x^2+3x-7) - (4x^2-x+12)$

$x^2+4x-19$

$(-5y^2-y-8) - (-2y^2+7n-3)$

$-3y^2-7n-y-5$



Given the perimeter, find the unknown side.

$(6w+14)-(4w+6)$

$2w+8$ both ends so divide by 2

$\frac{2w+8}{2} = \boxed{w+4}$

Multiplying and Dividing Polynomials

-multiplying: multiply numbers, add exponents on common bases
-dividing: divide numbers, subtract exponents on common bases

Simplify each of the following:

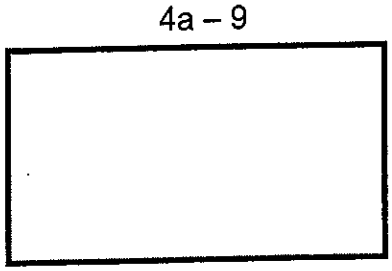
$2a(3a^2+4a-6)$

$6a^3+8a^2-12a$

$\frac{12a^2b^3-16a^3b^6}{4a^2b^2}$

$3b-4ab^4$

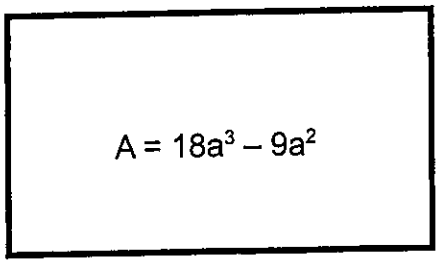
Find the area.



$(4a-9)(3a)$

$= 12a^2 - 27a$

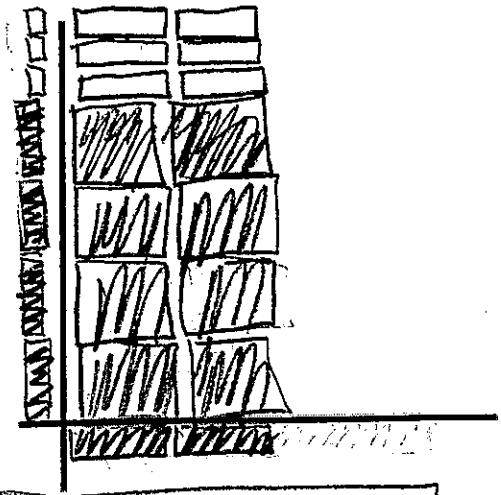
Find the side length.



$\frac{18a^3 - 9a^2}{9a^2}$

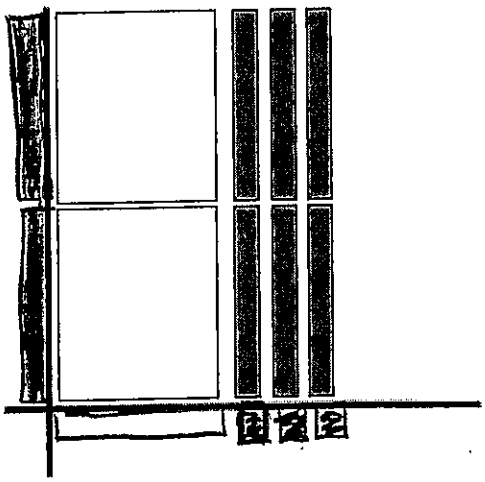
$= 2a - 1$

Draw in algebra tiles to represent the following expression: 2a (4a – 3) and also write a polynomial to express the equation.



$2a(4a-3) = 8a^2 - 6a$

Given the following tiles, what was the original expression? Draw the outer tiles and write the polynomial equation as well.

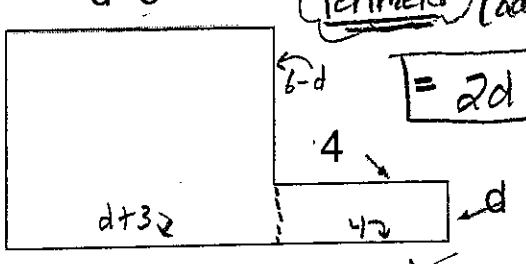


$2x(-x+3) = -2x^2 + 6x$

OR

$-2x(x-3) = -2x^2 + 6x$

Find the perimeter and area of the shape below.



Perimeter (add all sides)

$6 + (d+3) + 4 + d$

$= 2d + 26$

Area

$6(d+3)$ $\quad 4(d)$

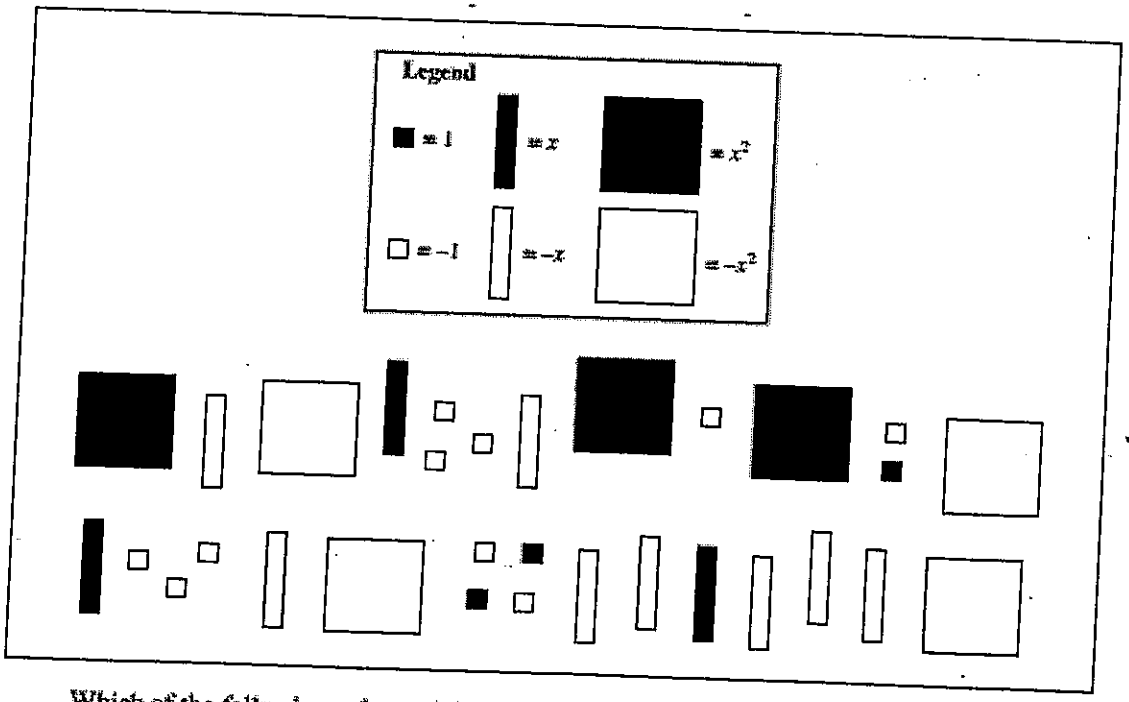
$6d + 18 + 4d$

Two students, Robert and Jacob, simplify the expression $3(x^2 + 4x - 1) - (2x + 5)$, as shown below.

	Robert	Jacob
Step 1	$= 3x^3 + 12x - 3 - (2x + 5)$	$= 3x^2 + 12x - 1 - (2x + 5)$
Step 2	$= 3x^2 + 12x - 3 - 2x + 5$	$= 3x^2 + 12x - 1 - 2x - 5$
Step 3	$= 3x^2 + 10x + 2$	$= 3x^2 + 10x - 6$

The first error made in the simplification of the expression shown above was made by

A. Robert in Step 1
B. Jacob in Step 1
C. Robert in Step 2
D. Jacob in Step 2



$-x^2-5x-7$

Which of the following polynomial expressions could be added to the expression shown above to result in a sum that contains only a constant term?

A. $x^2 + 5x + 3$
B. $4x^2 + 8x$
C. $-x^2 - 5x - 3$
D. $-4x^2 - 8x$

✓ A. $-x^2-5x-7$ + x^2+5x+3 = -4 Constant

× B. $-x^2-5x-7$ + $4x^2+8x$ = $3x^2+3x-7$

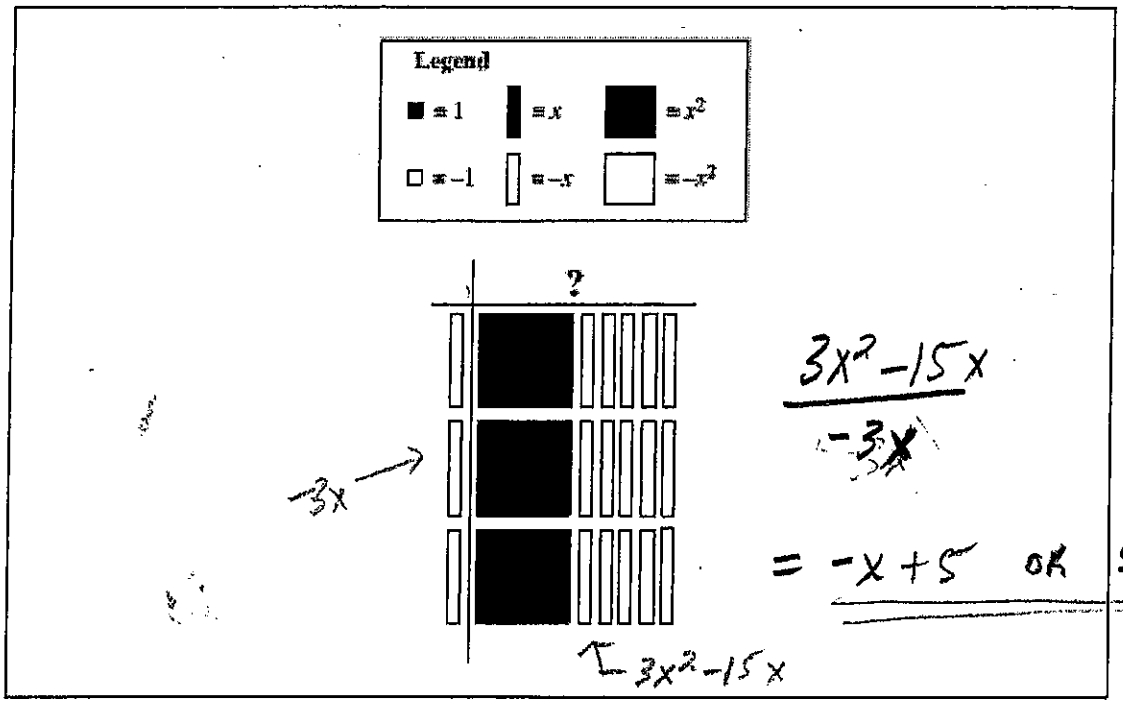
× C. $-x^2-5x-7$ + ...

× D. $-x^2-5x-7$ + $-4x^2-8x$

The quotient of $(-12x^2 - 9x) \div \blacksquare x$ is $-4x - 3$. What is the value of $\blacksquare$?

Answer: 3

$$\frac{-12x^2 - 9x}{?x} = -4x - 3$$



Which of the following polynomials represents the unknown expression in the model shown above?

A. $x^2 - 5x$
B. $-x^2 + 5x$
C. $x - 5$
D. $-x + 5$

8. Solving Equations

Simplify...Collect Variables...Isolate Variable (SCI)

Solve the following questions:

$3(2a + 1) - (a - 2) = 2(3a + 4)$

$6a + 3 - a + 2 = 6a + 8$

$5a + 5 = 6a + 8$

$-5a \quad -5a$

$5 = a + 8$

$-8 \quad -8$

$6\left(\frac{x+1}{2}\right) - \left(\frac{x-7}{6}\right)6 = (3)6$

$3x + 3 - x + 7 = 18$

$2x + 10 = 18$

$-10 \quad -10$

$\frac{2x}{2} = \frac{8}{2}$

Inequalities

Remember to reverse the inequality when multiplying or dividing by a negative to solve.

Solve and graph each according to its graphing rule. Use number lines provided.

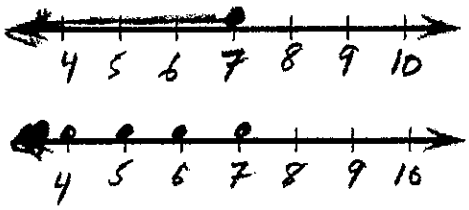
$7x+3 \le 52$ $\quad x \in R$

$-3 \quad -3$

$7x \le 49$

$\frac{7x}{7} \le \frac{49}{7}$ $\quad x \in I$

$x \le 7$



$2(5-3b) < -7b+2$ $\quad x \in R$

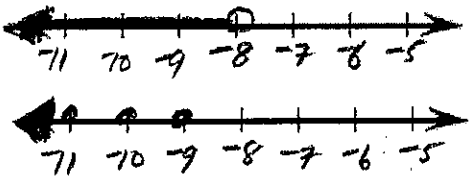
$10-6b < -7b+2$ $\quad x \in I$

$+7b \quad +7b$

$10+b < 2$

$-10 \quad -10$

$b < -8$



$-4x-3 \le 4$ $\quad x \in N$

$+3 \quad +3$

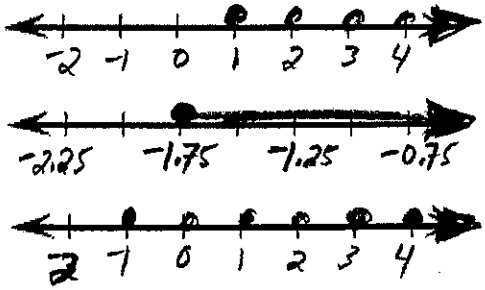
$-4x \le 7$ $\quad x \in R$

$\frac{-4x}{-4} \le \frac{7}{-4}$ $\quad x \in I$

$x \ge -1.75$

OR

$-1\frac{3}{4}$



Members of a recreation centre pay a one-time registration fee in addition to a fixed monthly fee of $15. The following table shows the total amount paid to be a member of the centre for a certain number of months.

Let n be one time fee.

$n + 15(4) = 135$

$n + 60 = 135$

$-60 \quad -60$

$n = 75$

Number of Months	Total Amount Paid
4	$135
6	$165
12	$255

✓ $75 + 15(6) = 165$

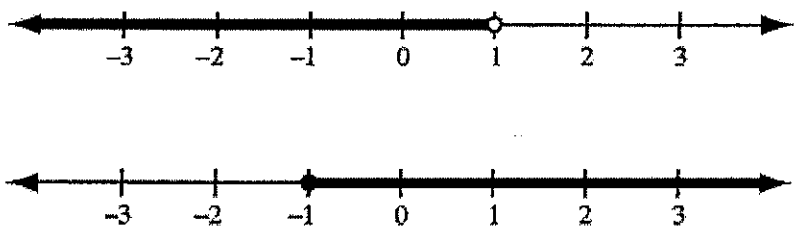
✓ $75 + 15(12) = 225$

Numerical Response

According to the information above, what is the cost of the one-time registration fee?

Answer: 75 **dollars**

An inequality is shown on each number line below.



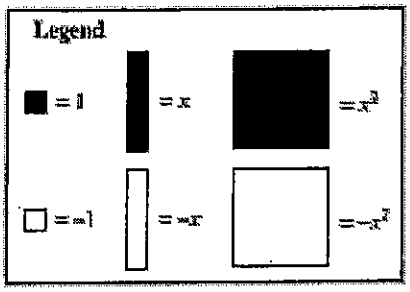
Which expression represents the values (n) that are part of both inequalities?

A. $-1 \leq n \leq 1$

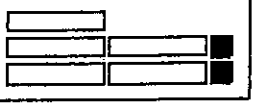
B. $-1 \leq n < 1$

C. $-1 < n \leq 1$

D. $-1 < n < 1$



The left and right sides of an equation are represented below.

Left side	Right side
	

$2x - 5 = -5x + 2$
$+5x \quad +5x$
$7x - 5 = 2$
$+5 \quad +5$
$\frac{7}{7}x = \frac{7}{7}$
$x = 1$

The solution to the equation above can be represented by

A. 

B. 

C. 

D. 

Tara, Jennifer, and Mindy donated some money to a charity. Jennifer donated twice as much as Tara, and Mindy donated $10 less than Jennifer.

If the **total** amount donated to the charity is $50, then how much money did Tara donate?

A. $6
B. $8
C. $12
D. $24

Tara's donation n
Jen's donation 2n
Mindy's donation 2n−10

$5n - 10 = 50$
$+10 \quad +10$
$\frac{5n}{5} = \frac{60}{5}$
$n = 12$

Which pair of expressions below are equivalent for all values of x?

A. $-3x + 4x^2 + 2$ and $4x^2 - 2 + 3x$ ×

B. $-3x + 4x^2 + 2$ and $2 - 3x + 4x^2$

C. $2 - 4x^2 + 3x$ and $-4x^2 + 3x - 2$ ×

D. $2 - 4x^2 + 3x$ and $-3x + 4x^2 + 2$ ×

Nathan completed a 5 km run on his first day of training for a cross-country race. He increased the length of his next training runs by 1.5 km each time.

Which of the following equations could be used to determine the distance (d) that Nathan ran on each training run (r)?

A. $d = 1.5r$ ~ doesn't include 1st day 5 km run

B. $d = 5r$ ~ not going 5 km more each run

C. $d = 1.5 + 3.5r$

D. $d = 3.5 + 1.5r$

1st run = 5 Km

2nd run = 6.5 Km

r	d	
1	5	
2	6.5	+1.5
3	8	
4	9.5	

+1

$d = 1.5r + 3.5$

The relationship between two variables is given in the equation $35 + 15n = A$.

Which of the following situations could be represented using the equation above?

A. The price of a caterer for a party is \$35 for each dinner ordered and \$15 for each dessert ordered.

B. The bill for framing a painting is \$35 for each square meter of glass required and \$15 for the wooden frame.

C. The fee for a computer consultant is \$15 for an administration charge and \$35 for each hour worked.

D. The cost of silk screening a design on T-shirts is \$15 for each shirt created and a \$35 design fee.

\$35 ↑ flat rate

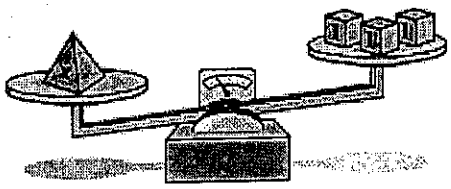
\$15 ↑ times # shirts

The value of x in the equation $\frac{x}{5} + 1 = 26$ is 125.

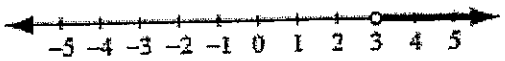
$-1 \quad -1$

$5\left(\frac{x}{5}\right) = (25)5$

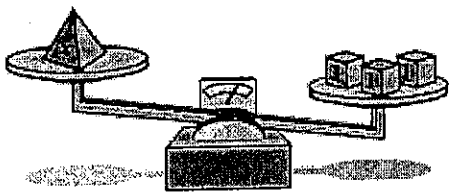
$x = 125$



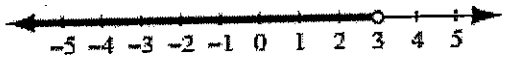
I $x > 3$



III $x > 3$



II $x < 3$



IV $x < 3$

The two diagrams shown above that **both** represent the inequality $x > 3$ are numbered

A. I and III
B. I and IV
C. II and III
D. II and IV

How many whole numbers could represent the value of x in the inequality statement $\frac{1}{4} < \frac{3}{x} < 0.5$?

Needs to be bigger than 0.25 but less than 0.5

Answer: 5 **whole numbers**

$\frac{3}{6}$ $\frac{3}{7}$ $\frac{3}{8}$ $\frac{3}{9}$ $\frac{3}{10}$ $\frac{3}{11}$ $\frac{3}{12}$

$\times$ ✓ ✓ ✓ ✓ ✓ $\times$

The value of x in the equation $2(x + 5) - 12 = 50$ is

A. 24
B. 26
C. 32
D. 36

$2x + 10 - 12 = 50$

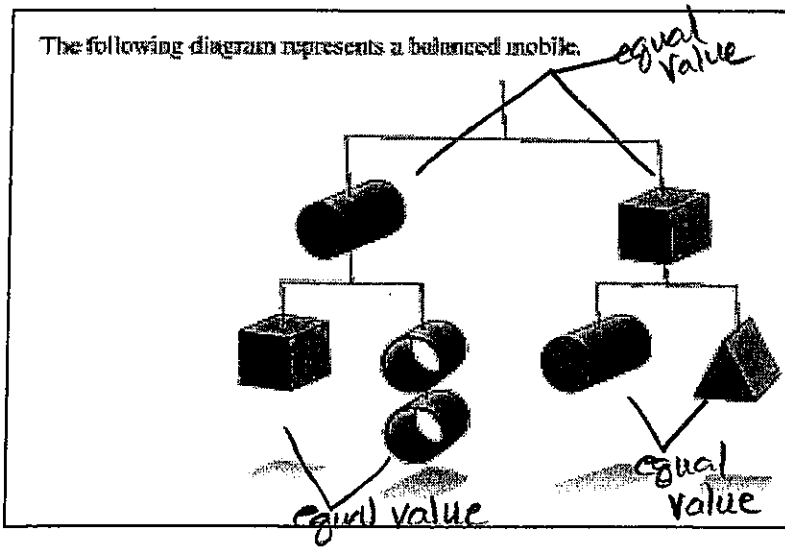
$2x - 2 = 50$

$+2 \quad +2$

$\frac{2x}{2} = \frac{52}{2}$

$x = 26$

The following diagram represents a balanced mobile.



2 hollow cylinders = cube = solid cylinder = triang prism

Which of the following equations correctly represents the relationship between some of the objects shown in the diagram above?

A.  ✗

B.  ✗

C.  ✗

D.  ✓

X:	-0.054	-0.054 biggest
Y:	$-\frac{11}{3}$	$-3.\overline{6}$ middle
Z:	$-\frac{15}{4}$	-3.75 smallest

Which of the following inequalities represents the rational numbers shown above?

A. $Y < Z < X$

B. $Y < X < Z$

C. $Z < X < Y$

D. $Z < Y < X$

Word Problems

1. Include LET and THEN statements. **2. Write an equation.**
3. Show work to solve (SCI). **4. Include a sentence.**
5. Verify answer.

1. The sides of a triangle are 3 consecutive numbers. It's perimeter is 54 cm. How long is each side?

Let one side be n
Then 2nd side is n+1
Then 3rd side is n+2

$3n+3=54$
$-3 \quad -3$
$\frac{3n}{3}=\frac{51}{3}$
$n=17$

17, 18 & 19

Verify
$17+18+19$ ✓
$=54$

The consecutive numbers for the triangle sides are 17, 18 & 19 cm.

2. A jar contains $36.25 in dimes and quarters. There are 250 coins in the jar. How many quarters are in the jar?

Let # quarters be n
Then # dimes is 250−n

$25n + 10(250-n) = 3625$
$25n + 2500 - 10n = 3625$
$15n + 2500 = 3625$
$-2500 \quad -2500$
$\frac{15n}{15}=\frac{1125}{15}$
$n=75$

There are 75 quarters in the jar.

Verify
$75(0.25)+175(0.1)$
$18.75 + 17.50$
$=36.25$ ✓

3. Steve works in a clothing store. He earns $1925 a month, plus a commission of 10% of his sales. One month, Steve earned $2725. What were Steve's sales?

Let Steve's sales be n

$1925 + 0.1n = 2725$
$-1925 \quad -1925$
$\frac{0.1n}{0.1}=\frac{800}{0.1}$
$n = 8000$ sales

Steve had 8000 sales in that month.

Verify
$1925 + 0.1(8000)$
$1925 + 800$
$=2725$ ✓

4. A large pizza with tomato sauce and cheese cost $7.50 plus $1.50 for each additional topping. A customer orders a large pizza and is charged $16.50. How many toppings did the customer order?

Let the # of extra toppings be n

$7.50 + 1.50n = 16.50$
$-7.50 \quad -7.5$
$\frac{1.5n}{1.5}=\frac{9}{1.5}$
$n = 6$

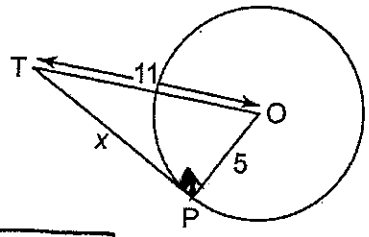
The customer ordered 6 extra toppings.

Verify
$7.50 + 1.5(6)$

9. Circle Geometry

Key words: tangent, chord, inscribed angle, central angle, subtended

Solve for each of the unknown values.



$a^2+b^2=c^2$

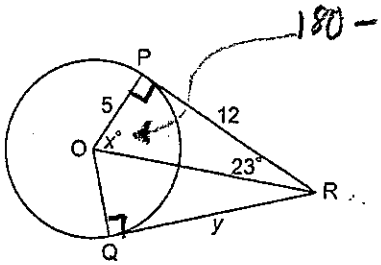
$a^2+5^2=11^2$

$a^2+25=121$

$\sqrt{a^2}=\sqrt{96}$

$a=9.8$

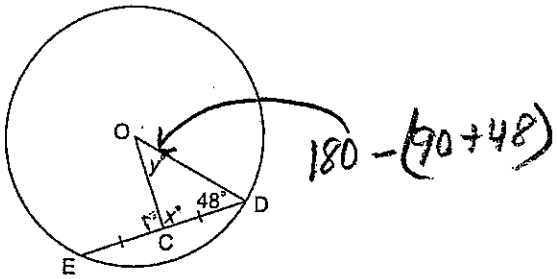
$x=9.8$



$180-(90+23$

$x^0=67^\circ$

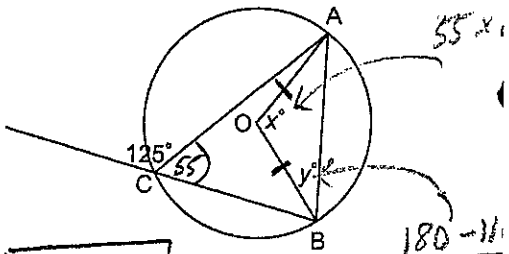
$y=12$



$180-(90+48)$

$x^0=90^\circ$

$y^0=42^\circ$

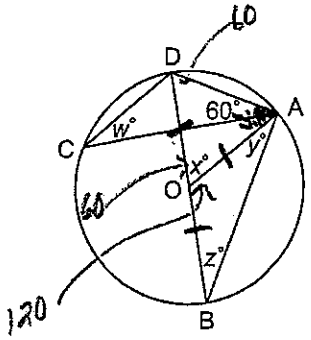


55

$\frac{180-11}{2}$

$x^0=110^\circ$

$y^0=35^\circ$



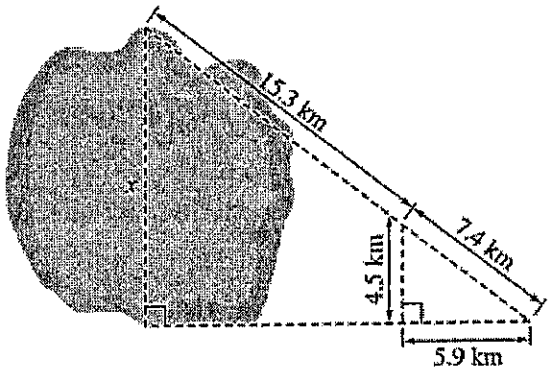
$w^0=30^\circ$ ← inscribed & "x" is central (arc AD subtend both

$x^0=60^\circ$ ← $180-120$

$y^0=30^\circ$ ← $\frac{180-120}{2}$

$z^0=30^\circ$

In the diagram below, x represents the approximate distance across a circular lake.



$\frac{4.5}{x} = \frac{7.5}{22.7}$

$x = 13.804054$

diameter

radius $= 6.902027$

What is the approximate area of the lake, to the nearest square kilometre?

A. 599 km^2

B. 272 km^2

C. 150 km^2

D. 68 km^2

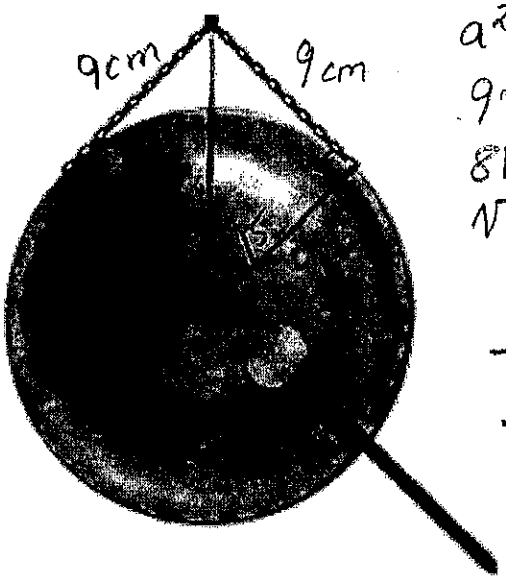
$A = \pi r^2$

$A = 3.14 (6.902027)^2$

$A = 3.14 (47.63797671)$

$A = 149.5832469$

The gong shown below is 30 cm in diameter and hangs by a chain from a nail. The total length of the chain is 18 cm. The lengths of chain on each side of the nail are equal to each other and form a tangent to the gong.



$a^2 + b^2 = c^2$

$9^2 + 15^2 = c^2$

$81 + 225 = c^2$

$\sqrt{306} = c^2$

$17.492855 = c$

-15

2.492855 cm

Note: The diagram shown above has **not** been drawn to scale.

How far above the top of the gong is the nail, to the nearest tenth of a centimetre?

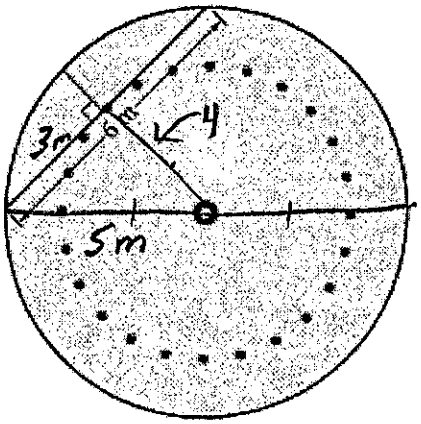
A. 2.3 cm

B. 2.5 cm

C. 12.0 cm

D. 17.5 cm

A diagram of a swimming pool is shown below. The dotted circle represents floating buoys. The pool has a diameter of 10 metres.



$a^2 + b^2 = c^2$

$a^2 + 3^2 = 5^2$

$a^2 + 9 = 25$

$-9 \quad -9$

$\sqrt{a^2} = \sqrt{16}$

$a = 4\text{m}$

radius $5 - 4$

$= 1\text{m}$

The shortest distance from the buoys to the edge of the pool is

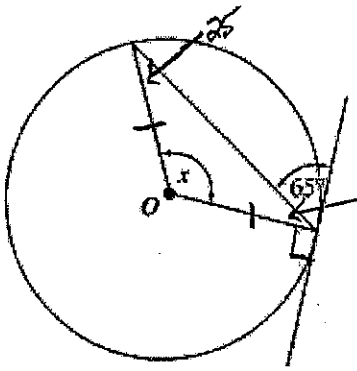
A. 1 m

B. 2 m

C. 3 m

D. 4 m

9E here



$90 - 65$

$= 25°$

$180 - 50$

$= 130$

Note: The diagram shown above has **not** been drawn to scale. The letter *O* represents the centre of the circle.

If the line shown above is a tangent to the circle, then the measure of angle x is

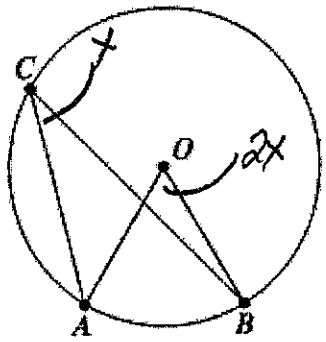
A. 110°

B. 115°

C. 130°

D. 155°

The letter O in the diagram below represents the centre of the circle.



Note: The diagram shown above has **not** been drawn to scale.

If the sum of $\angle AOB$ and $\angle ACB$ is 75°, then $\angle ACB$ equals

A. 30°
B. 25°
C. 20°
D. 15°

$2x + x = 75$
$3x = 75$
$x = 25$

(9A here.)

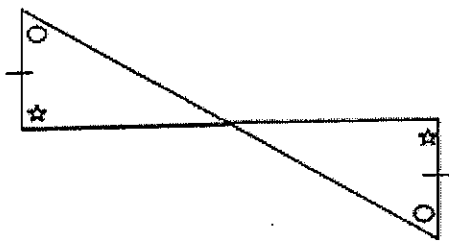
10. Similarity and Symmetry

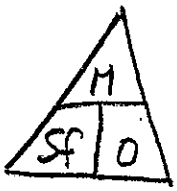
Key Words: scale factor, similar, line symmetry, rotational symmetry, order of rotation, angle of rotation

-a scale factor less than one is a reduction
-a scale factor greater than one is an enlargement

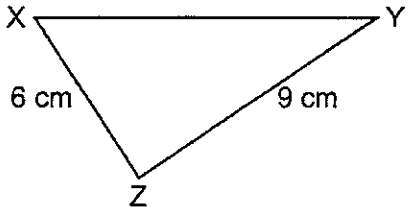
← 9A here
(go back to 10/6 question)

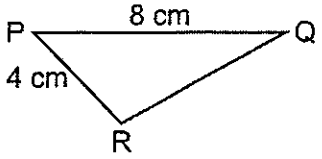
These are congruent triangles.





What is the scale factor of these two similar triangles?

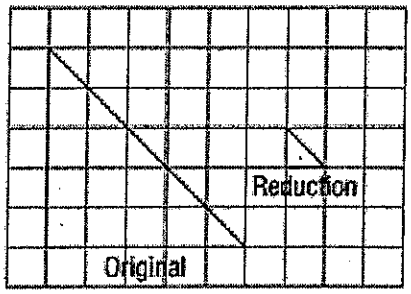




scale factor

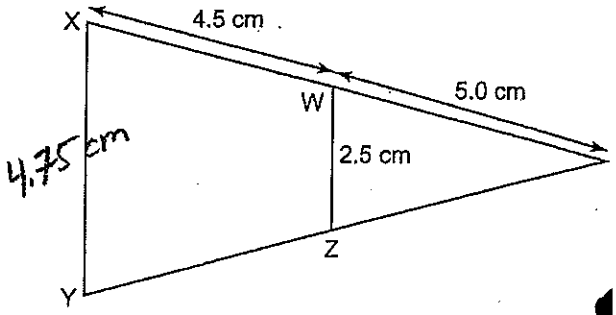
$\frac{4}{6} = \boxed{\frac{2}{3}}$

Determine the scale factor for this reduction as a fraction and as a decimal.



$\frac{1}{5}$ OR 0.2

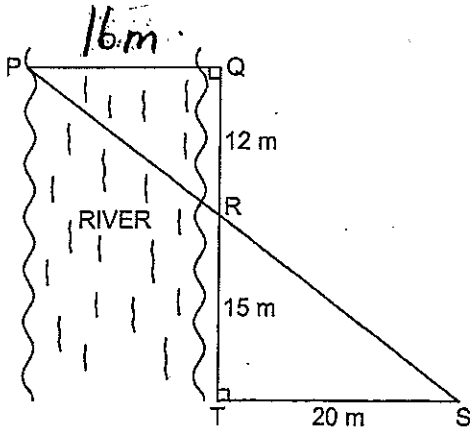
Find the length of line XY.



$\frac{2.5}{n} = \frac{5}{9.5}$

$\boxed{n = 4.75 \text{ cm}}$

A surveyor wants to determine the width of a river. She measures distances and angles on land, and sketches this diagram. What is the width of the river, PQ?



$\frac{12}{15} = \frac{n}{20}$

$\boxed{n = 16 \text{ m}}$

Line Symmetry

-if a shape can be folded onto itself in a mirror image it has line symmetry

Rotational Symmetry

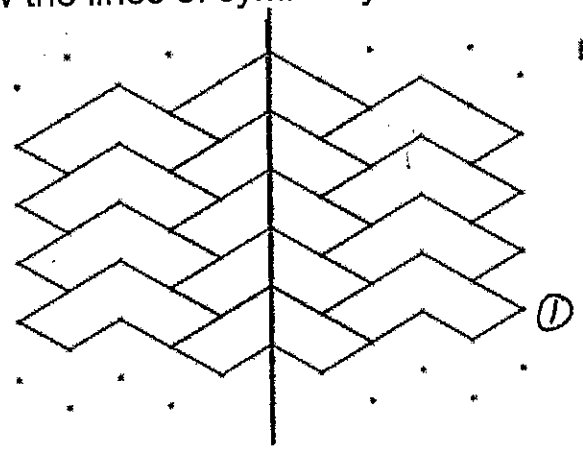
-if a shape can be rotated around a point to match up with the original perfectly, it has rotational symmetry

-order of rotation refers to the number of times a shape can rotate to orient onto the original perfectly

-angle of rotation refers to the number of degrees through which a shape rotates to orient onto the original perfectly

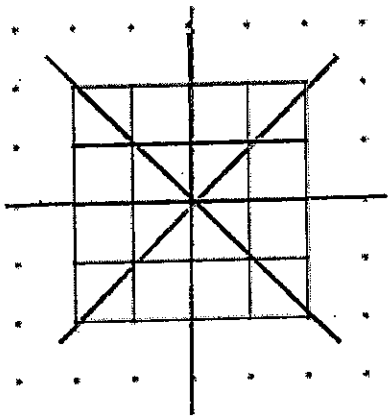
Draw the lines of symmetry in each of the following tessellations.

a)



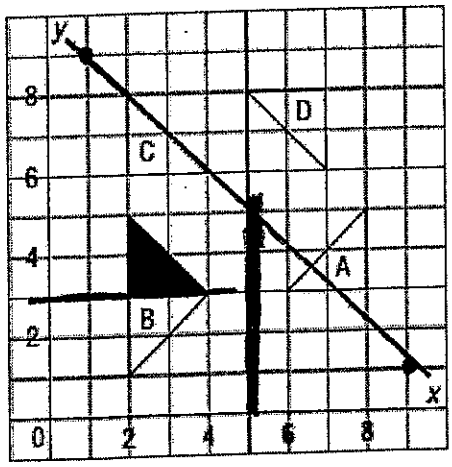
①

b)



④

Identify the triangles that are related to the shaded one by a line of reflection. Draw the line and also describe its location e.g. y=5



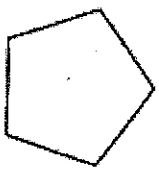
original & A $x = 5$

original & B $y = 3$

original & C None

original & D (6, 1) to (1, 9) oblique

What is the order and degree of rotational symmetry for this regular pentagon?



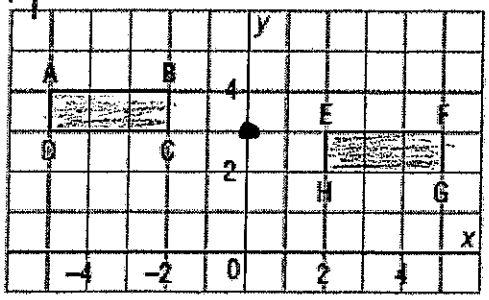
order 5

degree 72°

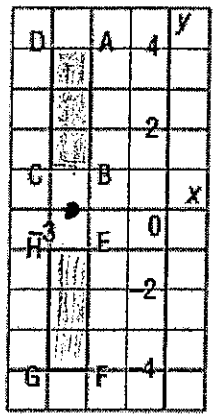
For each pair of rectangles, determine whether they are related by symmetry (line and/or rotational).

* No line symmetry
* 180°
* order 2 rotational symmetry around point (0, 3)

a)

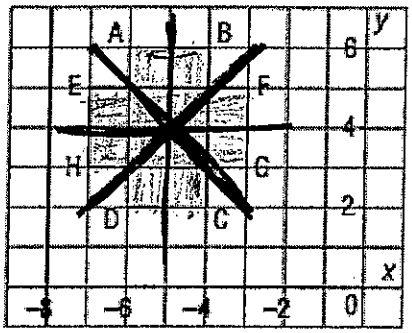


b)



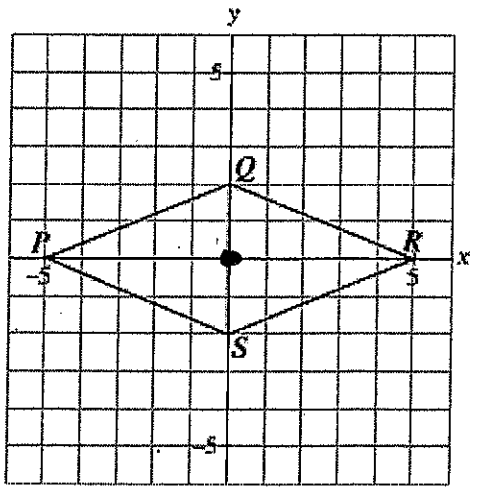
* one line symmetry $y = 0$
* 180° order 2 rotational symmetry around po (−2.5, 0)

c)



* 4 lines of symmetry
* 90° order 4 rotational symmetry around point (−5, 4)

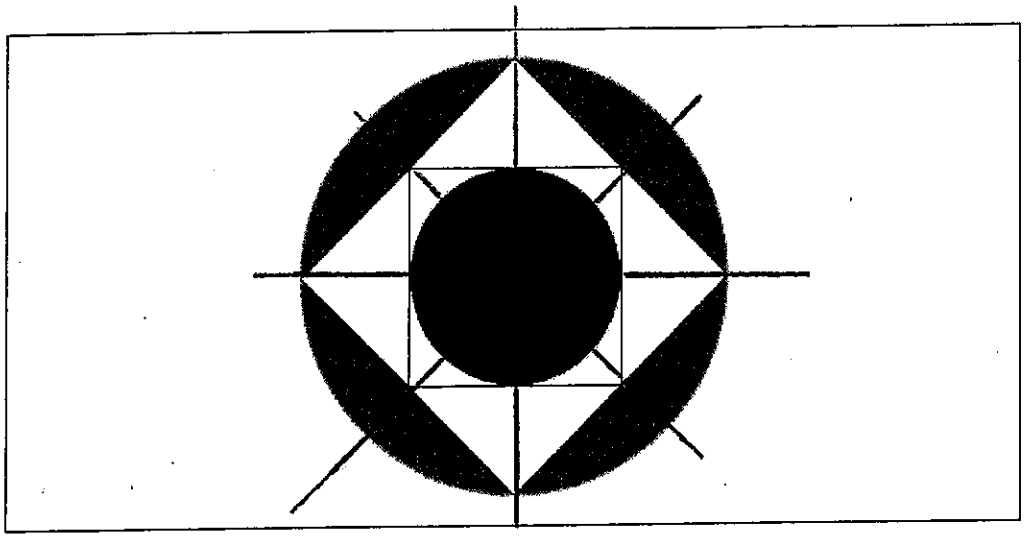
The 2-D shape shown below is rotated about its centre.



Matches up twice

What are the order of rotational symmetry and the angle of rotation of the 2-D shape?

Row	Order of rotational symmetry	Angle of rotation
A.	1	180°
B.	1	360°
(C.)	2	180°
D.	2	360°



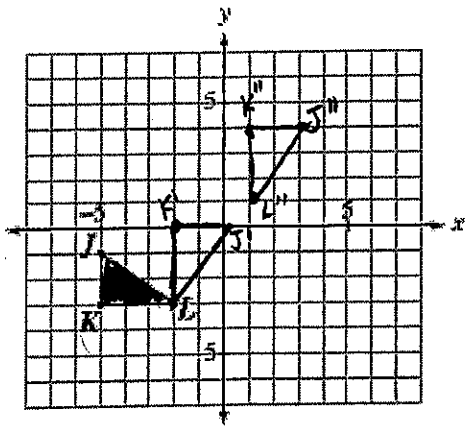
Numerical Response

How many lines of symmetry does the diagram shown above have?

Answer: 4 **lines**

Triangle JKL, shown below, undergoes the following transformations:

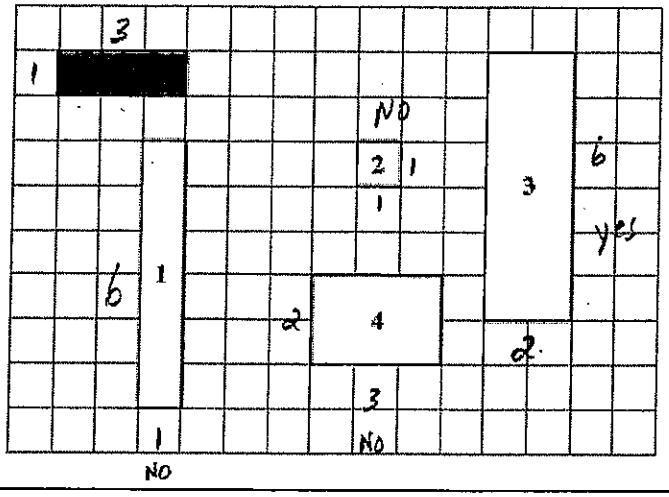
- a 90° clockwise rotation about vertex L
- a translation of 3 units right and 4 units up



Which of the following rows represents the ordered pair for each vertex after both the transformations described above have been completed?

Row	J''	K''	L''
A.	(1, 1)	(1, 4)	(3, 4)
B.	(1, 1)	(1, –2)	(–1, –2)
C.	(4, 3)	(2, 3)	(2, 0)
(D.)	(3, 4) ✓	(1, 4) ✓	(1, 1) ✓

Four-sided Polygons



Which of the polygons above is proportional to the shaded rectangle?

A. 1
B. 2
C. 3
D. 4

11. Data Analysis and Probability

Nina and Sarah observe that 6 of their 10 female classmates are shorter than 160 cm. Nina concludes that of the 410 students in their school, 246 are shorter than 160 cm. Sarah believes Nina's conclusion cannot be supported by her observation.

Which of the following statements **best** supports Sarah's belief?

A. Nina's survey sample contains only female students.
B. Nina's probability calculation is incorrect.
C. Nina did not use a proper questionnaire.
D. Nina completed her survey too quickly.

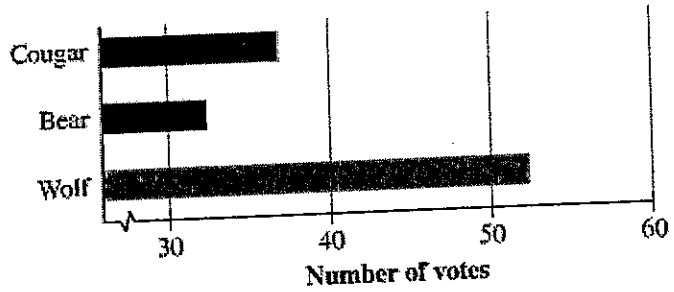
Ethan conducts a survey to determine the demand for an outdoor skating rink in his community.

Ethan can **best** minimize the bias in his survey by collecting data from people who

(A.) are different ages
B. live in different cities ✗
C. participate in figure skating ✗
D. visit the rink at the same time each day ✗

The student council of a senior high school surveyed 120 out of 250 Grade 10 students only to determine which of three animals should be the school's new mascot. The results of the survey are shown below.

Student Responses to Mascot Survey



What potential bias exists in the data collection for this survey?

✗ **A.** The survey question is confusing.
✗ **B.** The survey took too long to complete.
(C.) The sample does not represent the population.
✗ **D.** The participants' cultural beliefs were not considered.