



Year 10 Mathematics Practice Exam #2

Time: 2 hours
Sections

Topic	Page	Result
Number Base skills: percentages; fractions; decimals; ratios; proportional thinking Higher level: multiple step problems; percentage change; standard form	2	
Algebra Base skills: simplifying; expanding and factorising, including quadratics; solving linear Higher level: solving with fractions and quadratics; writing equations in context; roots of terms	5	
Graphs Base skills: reading graphs in a context; plotting lines; using rules for patterns Higher level: equations of lines; plot a parabola; finding rules for patterns	8	
Measurement Base skills: perimeters and areas of triangles, quadrilaterals and circles; unit conversions Higher level: shapes composed of fractional or multiple simple shapes; rates; volumes; time	10	
Trigonometry Base skills: Pythagoras; finding a side using Trig Higher level: multiple step problems; situations without right angle given at the start	13	
Overall Grade		

It is expected that working is shown for all questions.

Number

For marker's use only		
Achieved	Merit	Excellence
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

QUESTION ONE

Put in a $>$, $<$ or $=$ sign to indicate which is bigger and which is smaller

- a) 6.42×10^4 6.085×10^5
- b) 4.3×10^{-2} 7×10^{-3}
- c) $-4\frac{1}{2}$ -3.5

QUESTION TWO

Sue and Ben split the profits of their on-line tutoring business in the ratio of S : B of 3 : 2.

- a) If Sue gets \$900 after the split, how much would Ben get?

- b) If they have \$840 to split, how much goes to Sue and how much to Ben?

QUESTION THREE

22% of a school's students are in Year 10.

If the school has 841 students, how many are in Year 10?

QUESTION FOUR

Jim has 5 pairs of shoes for sport, 2 pairs for school and 7 other pairs.

What percentage of his shoes are for school?

QUESTION FIVE

Jim buys a post that is 4.2 metres long. After he puts it into a hole that is 1.4 metres deep, how much will be above ground?

QUESTION SIX

Eagle Co. made a \$560,000 profit in 2018.

- a) They increased profit by 5% in 2019. How much was the new profit?

- b) If the 2018 profit was an increase of 7% over the 2017 profit, how much was the 2017 profit?

QUESTION SEVEN

Light travels 3×10^9 metres per second.
The earth is 1.5×10^{12} metres from the sun.
How long does light take to get from the sun to the earth?

QUESTION EIGHT

Eagle Co. make eagle badges.
Each badge uses 6g of silver.
Silver costs \$80 per 100g.

- a) If Eagle Co. have \$400 worth of silver, how many badges can they make?

- b) Eagle Co. pay their workers \$18 for every badge they make.

It takes Billy five-eighths of an hour to make a badge.

If Billy makes badges for 35 hours in a week, how much will he be paid in that week?

QUESTION NINE

Ryan eats two-thirds of his pizza. Emily eats half of her pizza. Because their pizzas are different sizes, they eat the same amount.

What is the ratio of the size of Ryan’s pizza to Emily’s pizza?

QUESTION TEN

The usual price of Eagle Co. necklaces is \$85.

- a) If they decide that they are going to have a “20% off” sale, how much will they sell for?

- b) If instead they decide that they are going to sell them for \$65, how much is the discount as a % from the \$85?

QUESTION ELEVEN

A file is one quarter downloaded.

After 2 more minutes it is two-fifths downloaded.

How much longer will the file take to download if it continues as the same rate?

Algebra

For marker's use only		
Achieved	Merit	Excellence
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

QUESTION ONE

Calculate the following expressions if $p = 3$, $q = -2$

a) $2pq =$ _____

b) $q + p =$ _____

QUESTION TWO

Solve these equations. Show your working.

a) $5 = x + 12$

b) $5x + 18 = 10$

c) $16 = 4(x + 2)$

d) $8x + 11 = 5x + 19$

e) $\frac{x+6}{3} = x+4$

QUESTION THREE

You must write **equations** and solve them for these questions. Show all working.

- a) An octagon has a perimeter of 36 cm. How long are the side lengths?

- b) Bill starts with some money. He gets \$20 more, then doubles that new amount. He now has \$140. How much did he start with?

- c) Three numbers average to 50.
The smaller one is 35 less than the biggest one.
The middle one is twenty five more than the smallest one.
What are the three numbers?

QUESTION FOUR

The molecular weight of an amine can be found by the formula:

$$W = 12C + 14N + H$$

where W is the molecular weight, C is the number of carbon atoms, N the number of nitrogen atoms and H the number of hydrogen atoms.

- a) *Ethyldiamine* is $\text{CH}_2\text{NH}_2\text{CH}_2\text{NH}_2$, so has two carbons, two nitrogens and eight hydrogens.
What is its molecular weight?

- b) *2-aminopentane* has a molecular weight of 87. It has one nitrogen and 13 hydrogens.
How many carbons does it have?

- c) Write a formula that gives how many nitrogens an amine has, if you know the number of carbons and hydrogens and have the molecular weight.

QUESTION FIVE

Simplify the following expressions:

- a) $4d - d =$ _____
b) $h \times h \times h \times h =$ _____
c) $2x + 3x^2 - 8x + 5x^2 =$ _____
d) $3p \times 5 =$ _____
e) $(5x^3)^2 =$ _____

QUESTION SIX

Expand, and simplify if appropriate

- a) $4(5 + x) =$ _____
b) $x(5x + 3) =$ _____
c) $-2x(x + 3) =$ _____
d) $2(x - 3) + 4(x + 10) =$ _____

- e) $(x + 5)(x + 4) =$ _____

QUESTION SEVEN

Factorise fully

a) $4x + 20 =$ _____

b) $a^2 + ab =$ _____

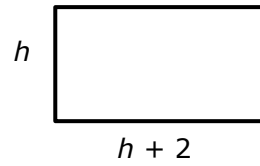
c) $10x^2 + 15x =$ _____

d) $x^2 + 15x + 50 =$ _____

e) $x^2 + 5x - 66 =$ _____

QUESTION EIGHTWrite expressions for these statements, with n as the unknown:a) A number is multiplied by six and then has ten added.
_____b) A number is halved after fifteen has been added to it.
_____**QUESTION NINE**

A rectangle is 2 cm wider than it is high

a) Write a simplified expression for the perimeter of the rectangle in terms of h .

_____b) If the perimeter of the rectangle is 161, how high is the rectangle?
(You must solve an equation.)

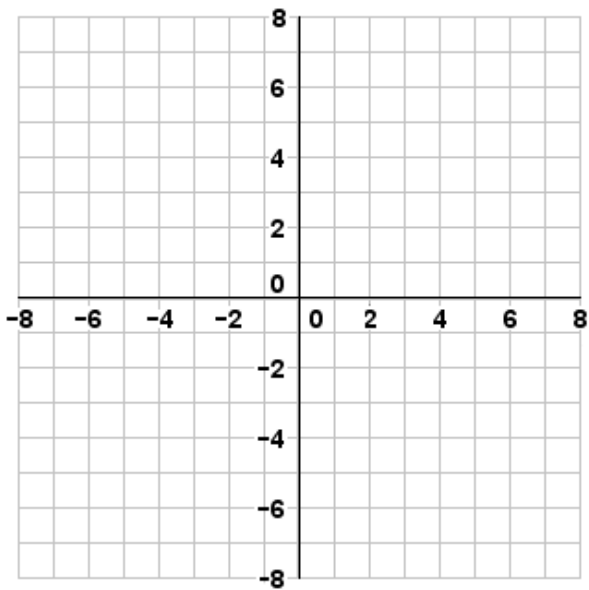
Patterns and Graphs

For marker's use only		
Achieved	Merit	Excellence
□	□	□

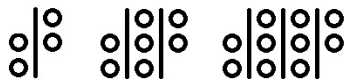
QUESTION ONE

Plot the following points on the grid below:

(2, 4), (6, 0), (4, -2), (-2, 8), (0, -6)



QUESTION TWO



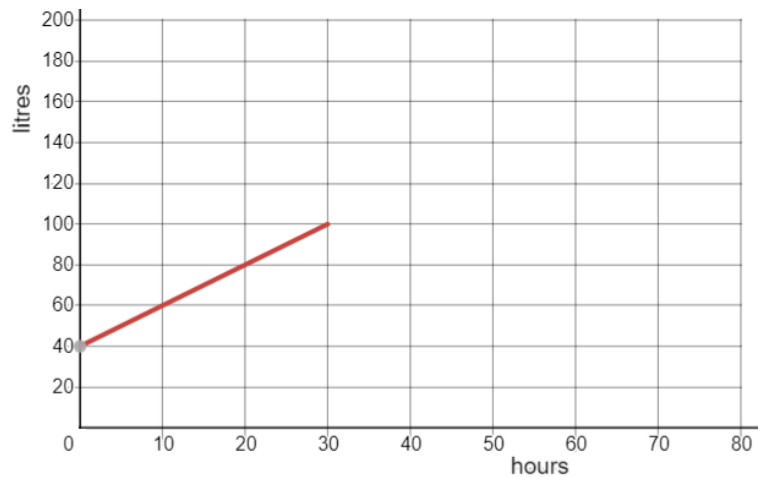
lines	circles
1	4
2	7
3	10

For the pattern above, if it continued:

a) How many circles would you get for ten lines?

b) Write a rule linking the number of circles, C, to the number of lines, L.

QUESTION THREE



The graph shows how full a water tank is, in litres, over a number of hours.

a) How full is the tank at the start?

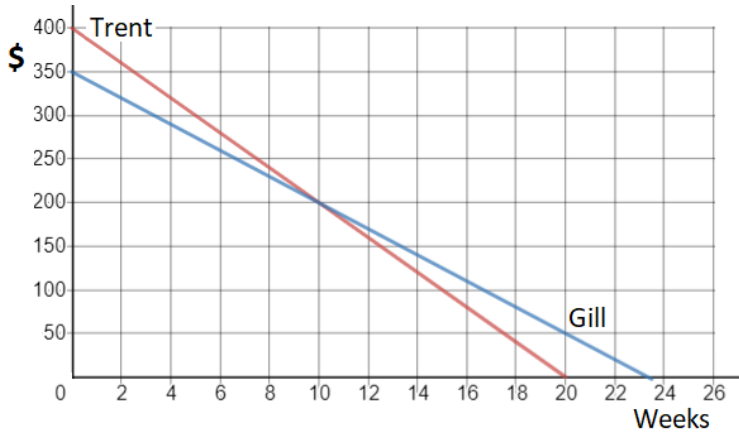
b) How fast is the tank filling at the start?

c) On the graph add lines that show that

- i) the water level does not change between 30 hours and 40 hours.
- ii) from the 40th hour onwards it loses water at 1 litre per hour.

d) What is the equation of the line from the 40th hour onwards?

QUESTION FOUR



Trent and Gill start with money in their bank accounts, but spend it over time.

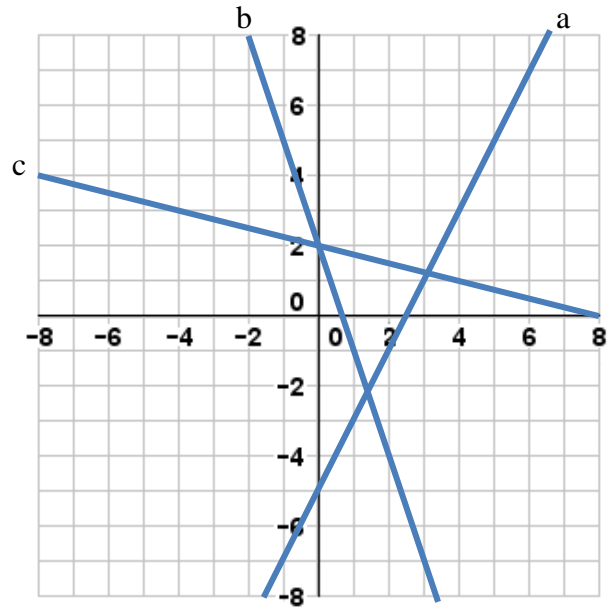
a) When does Gill have the same amount of money as Trent?

b) How can we tell that they spend their money at a constant rate?

c) How much money does Trent have after 15 weeks? Explain how you got your answer.

d) Why does Trent's line finish at Week 20 and not continue under the x -axis?

QUESTION FIVE



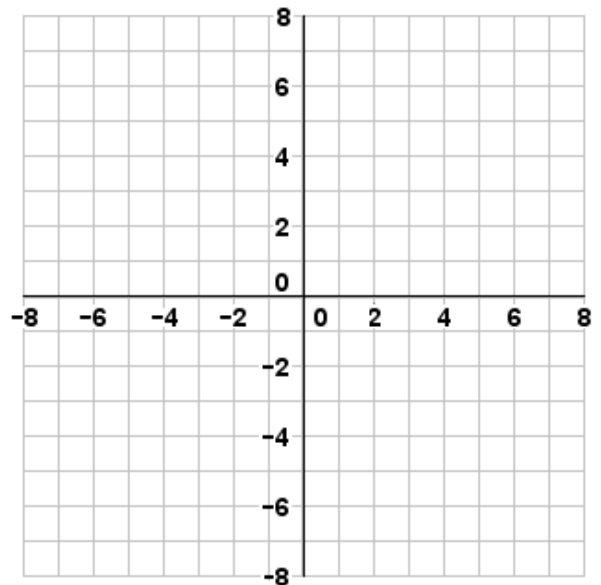
Write the equations for the lines above:

a) _____

b) _____

c) _____

QUESTION SIX



On the grid above, draw in the lines

a) $y = 5$

b) $y = 3x + 2$

c) $y = \frac{1}{2}x - 2$

Measurement

For marker's use only		
Achieved	Merit	Excellence
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Formulas

Area of Triangle = $\frac{1}{2} b h$

Area of Trapezium = $\frac{a + b}{2} h$

Area of Circle = πr^2

Circumference = πd

QUESTION ONE

Complete the following conversions:

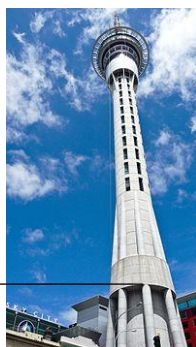
- a) 3.2 km = _____ m
- b) 75 mg = _____ g
- c) 270 seconds = _____ minutes
- d) 2.5 hours = _____ minutes

QUESTION TWO

- a) The device shown measures a person's weight. What units will it use?

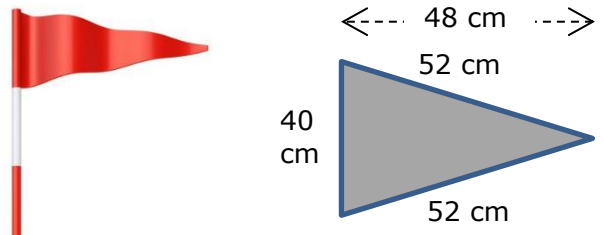


- b) The height of the Auckland Sky Tower should be measured in what units?



You must put units with the answers to the following questions

QUESTION THREE



- a) A golf flag is a triangle with the dimensions shown above. What is the area of the flag?



- b) The magnet above has a diameter of 25mm and a depth of 3mm. What is its volume?

QUESTION FOUR

Sandy's plane is taking off at 1:05 p.m.

- a) Write 1:05 p.m. in 24 hour time.

- b) The bus she takes to the airport is scheduled to arrive at 11:45 a.m. How long does she have to wait for her plane?

- c) If the plane trip lasts 135 minutes, when will it land?

QUESTION FIVE



A garden shed has a sloping roof.
It is 3.2 metres wide, 1.6 metres deep and drops from 2 to 1.8 metres high.
What is the volume of the shed?

QUESTION SIX



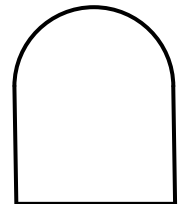
These windows are each made of two rectangular sheets of glass and four part circles adding to a semi-circle.

- a) The rectangular panes are 50 cm wide and 120 cm high. What is the area of each of the rectangular panes?

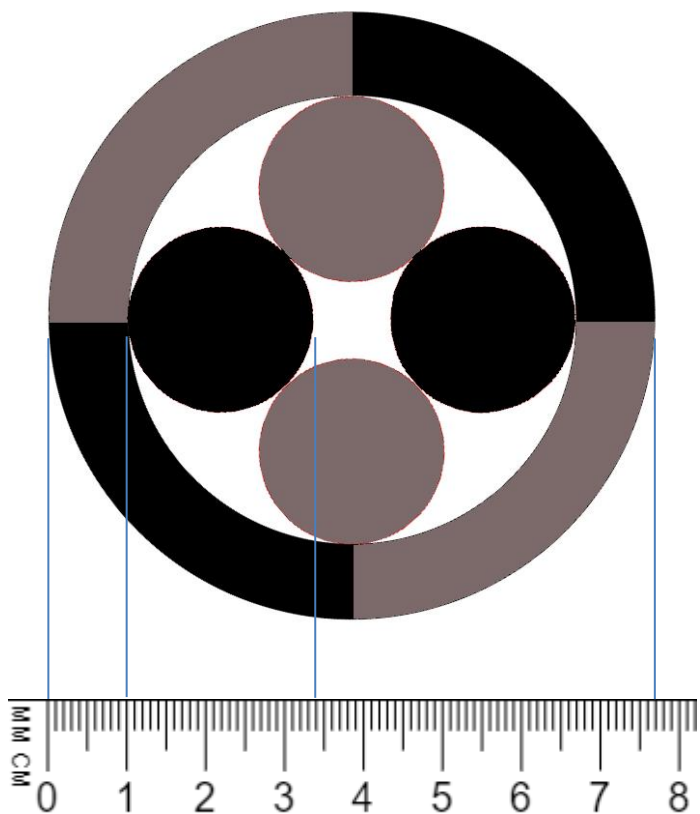


The part circle pieces have a radius of 50 cm. What is their area?

- c) What is the length of the frame – the distance around the outside of all the glass? *The shape is shown to the right.*



QUESTION SEVEN



Ben is a sign-writer. He has been paid to paint the logo shown above onto the Eagle Co. main offices.

He is to paint it at a scale of $10 \text{ mm} = 1 \text{ m}$ to the one shown above.

The paint he uses is quite expensive because it needs to not fade, so he doesn't want to order too much of it. Note, that there are two different colours in the logo.

The paint covers 4.5 m^2 per litre tin.

How many tins of each colour should he order?

Trigonometry

For marker's use only		
Achieved	Merit	Excellence
<input style="width: 40px; height: 20px;" type="checkbox"/>	<input style="width: 40px; height: 20px;" type="checkbox"/>	<input style="width: 40px; height: 20px;" type="checkbox"/>

QUESTION ONE

Evaluate the expressions:

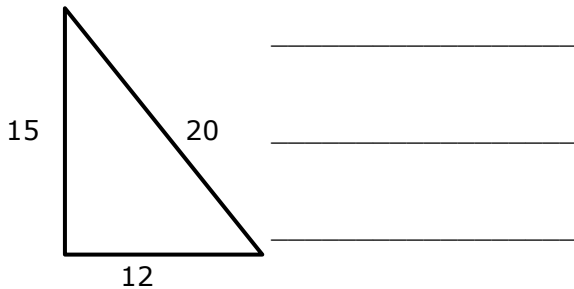
a) $\tan(40^\circ) =$ _____

b) $\sin^{-1}(0.3) =$ _____

c) $\cos^{-1}\left(\frac{3}{7}\right) =$ _____

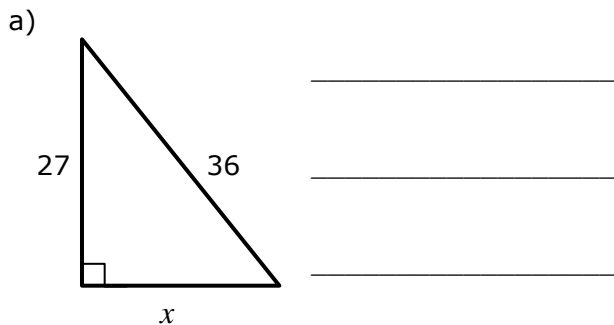
QUESTION TWO

Show, using Pythagoras' Theorem that the following triangle is not right angled.

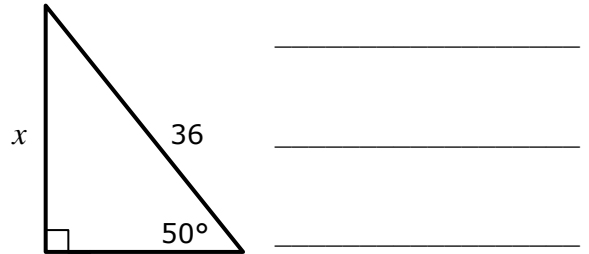


QUESTION THREE

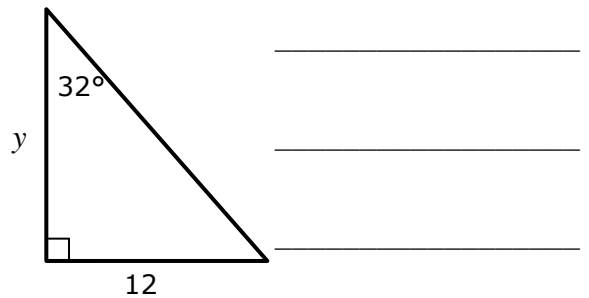
Calculate the unknown side length for each of these triangles:



b)

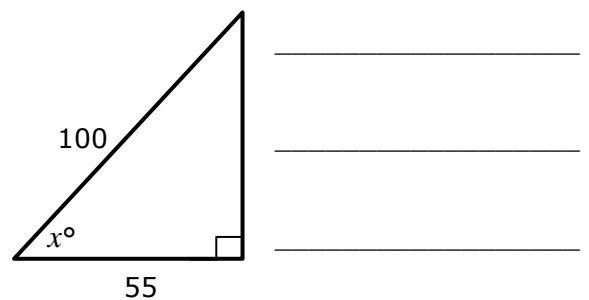


c)



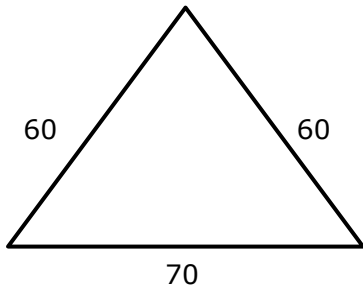
QUESTION FOUR

Calculate the unknown angle:



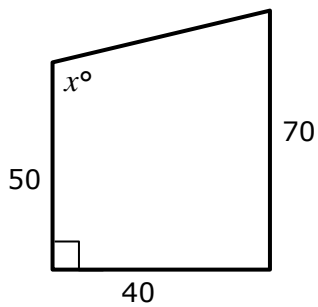
QUESTION FIVE

Calculate the height of the isosceles triangle shown:



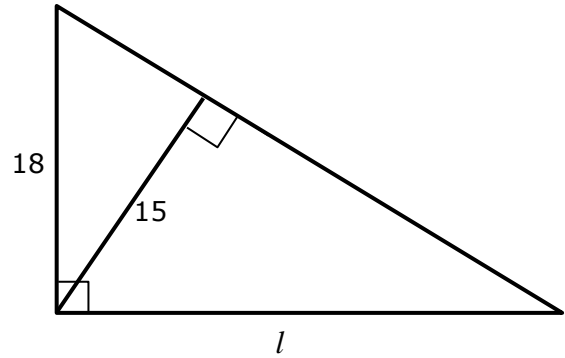
QUESTION SIX

Calculate the unknown angle x shown in this trapezium.



QUESTION SEVEN

Calculate the side length l .



QUESTION EIGHT

ABCDE is a square based pyramid..

$AB = BC = 12$ and the vertical height is 30.

What is the size of angle between the base and the edges, $\angle ACE$, shown dotted

