

GCSE (9-1) Mathematics
J560/06 Paper 6 (Higher Tier)

Question Set 1

1 (a)

A grain of salt weighs 6.48×10^{-5} kg on average.
A packet contains 0.35 kg of salt.

(a) Use this information to calculate the number of grains of salt in the packet.

$$\frac{0.35}{6.48 \times 10^{-5}} = 5401.23$$

(a) 5401 grains of salt [2]

(b)

(b) Explain why your answer to part (a) is unlikely to be the actual number of grains of salt in the packet.

Because not every grain of salt has the same size
and same weight as the average value

[1]

2

Sophie is organising a raffle.

- Each raffle ticket costs 50p.
- She sells 400 tickets.
- The probability that a ticket, chosen at random, wins a prize is 0.1.
- Each winning ticket receives a prize worth £3.

Sophie says

I expect the raffle to make over £100 profit.

Show that Sophie is wrong.

$$400 \times 0.5 = \text{£}200 \leftarrow \text{earn}$$

$$400 \times 0.1 = 40 \text{ winning tickets}$$

$$40 \times 3 = \text{£}120 \leftarrow \text{lost as prize money}$$

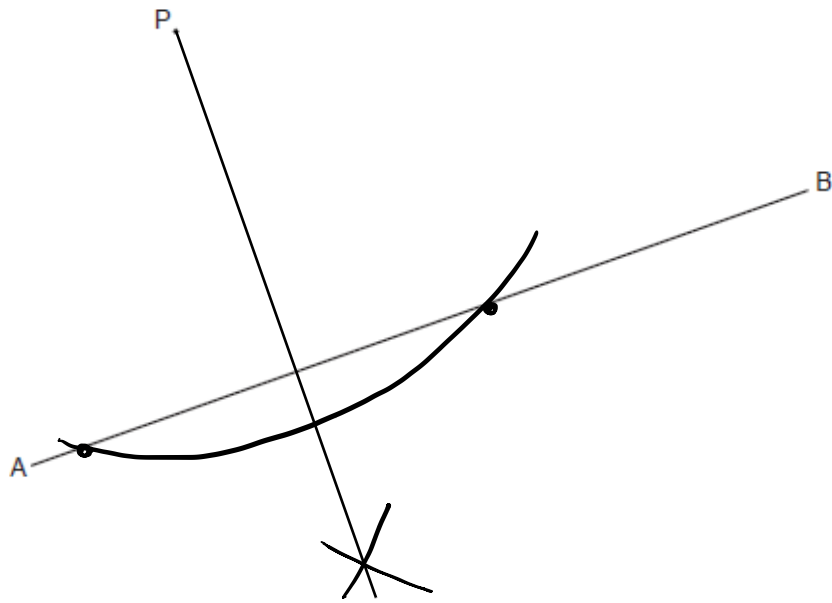
$$200 - 120 = \text{£}80 < \text{£}100$$

..... Sophie is expected to make a profit of £80 which
is less than £100

[4]

3

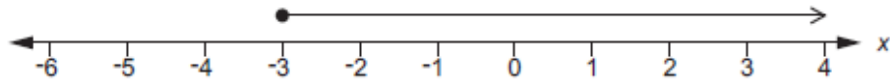
Construct the perpendicular from the point P to the line AB.
Show all of your construction lines.



[2]

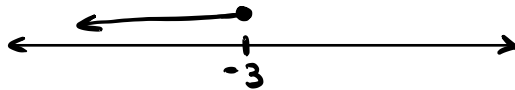
4

Martha's solution to the inequality $8x + 5 \leq 3x - 10$ is shown on the number line.



Is her solution correct?
Explain your reasoning.

$$8x + 5 \leq 3x + 10$$
$$5x \leq -5 \quad \div 5$$
$$\underline{x \leq -1}$$



No because from -3 the number goes smaller in the left direction not the right [4]

5

In 2017, the value of a house increased by 4%.
In 2018, the value of the house then decreased by 3%.

Teresa says

Over the two years the value of the house increased by exactly 1% because $4 - 3 = 1$.

Show that Teresa is wrong.

2016 : value of house = x

2017 : $1.04x$

2018 : $0.97 \times 1.04x = 1.0088x$

Teresa is wrong because the value which 3% decreased from is different from original value. [6]

Over two years, the value increased by 0.88%

6 (a)

Antonio rolls two fair six-sided dice and calculates the **difference** between the scores. For example, if the two scores are 2 and 5 or 5 and 2 then the difference is 3.

(a) Complete the sample space diagram to show the possible outcomes from Antonio's dice.

		Dice 2					
difference		1	2	3	4	5	6
Dice 1	1	0	1	2	3	4	5
	2	1	0	1	2	3	4
	3	2	1	0	1	2	3
	4	3	2	1	0	1	2
	5	4	3	2	1	0	1
	6	5	4	3	2	1	0

[2]

(b)

(b) Antonio rolls the two dice three times.

Calculate the probability that he gets a difference of 1 on all three rolls. Give your answer as a fraction in its lowest terms.

$$\frac{5}{18} \times \frac{10}{36} \times \frac{10}{36} \times \frac{10}{36}$$

$$= \frac{125}{5832}$$

$$\frac{125}{5832}$$

(b) [4]

7

Prove that the mean of any four consecutive even integers is an integer.

[4]

$$x \quad x+2 \quad x+4 \quad x+6$$

$$\frac{x + x+2 + x+4 + x+6}{4}$$

$$= \frac{4x + 12}{4}$$

$$= x + 3 = \text{mean}$$

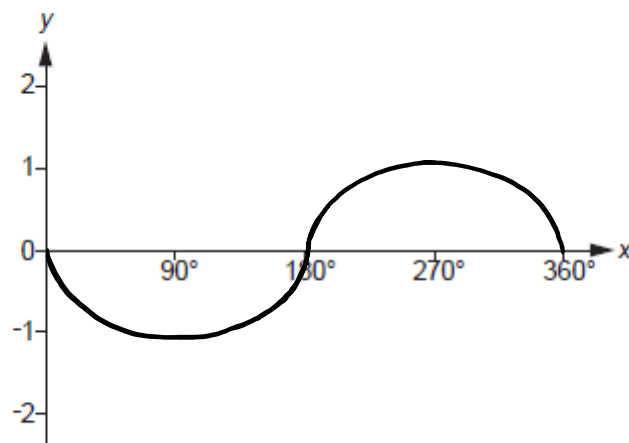
As x is an even integer and 3 is an integer, when two integers add together only integer is possible as the outcome

$$2 \quad 4 \quad 6 \quad 8$$

$$\frac{2+4+6+8}{4} = \frac{20}{4} = 5$$

$$\text{eg. } x=2 \quad x+3 = 2+3 = 5$$

8

Sketch the graph of $y = -\sin x$ for $0^\circ \leq x \leq 360^\circ$.

[3]

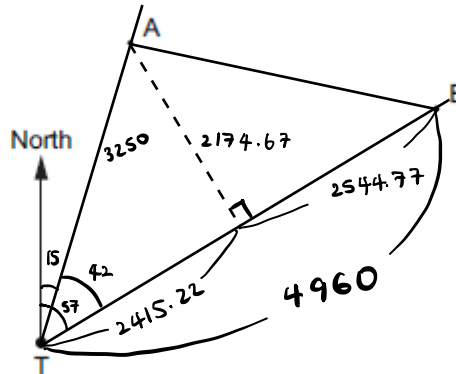
9 (a)

T is a radar tower.
A and B are two aircraft.

At 3pm

- aircraft A is 3250 km from T on a bearing of 015°
- aircraft B is 4960 km from T on a bearing of 057° .

Not to scale



(a) Aircraft A flies directly towards radar tower T at a speed of 890 km/h.

At what time will the aircraft pass over radar tower T?
Give your answer to the nearest minute.

$$\frac{3250}{890} = 3.6516... \text{ hrs}$$

↓

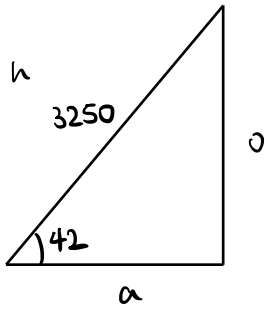
3hrs and 39 minutes

$0.6516... \times 60 = 39.101...$

$$3\text{pm} + 3\text{hrs } 39\text{mins} = \boxed{6:39 \text{ pm}}$$

(a) **6:39 pm** [4]

(b) Calculate the distance that was between aircraft A and aircraft B at 3pm.



$$\sin 42 = \frac{o}{3250}$$

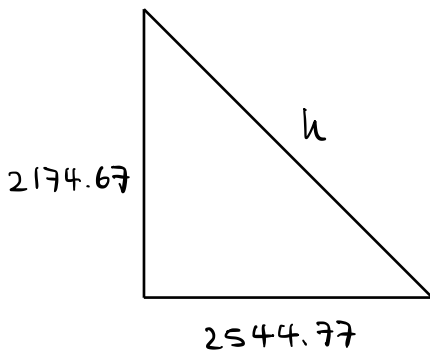
$$o = 3250 \sin 42$$

$$o = 2174.67 \dots$$

$$\cos 42 = \frac{a}{3250}$$

$$a = 3250 \cos 42$$

$$a = 2415.22$$



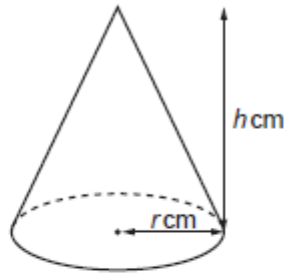
$$h^2 = 2174.67^2 + 2544.77^2$$

$$h^2 = 11205091.38$$

$$h = 3347.40 \dots$$

(b) 3347.40 km [4]

A cone has radius r cm and height h cm.



The height is three times the radius.
The volume of the cone is 2100 cm^3 .

Calculate the radius of the cone.

[The volume V of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$$h = 3r \quad V = \frac{1}{3}\pi r^2 h = 2100 \quad r = ?$$

$$\frac{1}{3}\pi r^2 \times 3r = 2100$$

$$\pi r^3 = 2100$$

$$r^3 = \frac{2100}{\pi}$$

$$r = \sqrt[3]{\frac{2100}{\pi}}$$

$$r = 8.7435 \dots$$

..... 8.74 cm [4]

11 (a) The point $(-5, 2)$ lies on the circumference of a circle, centre $(0, 0)$.

(a) Find the equation of the circle.

$$x^2 + y^2 = r^2 \leftarrow x = -5, y = 2$$

$$(-5)^2 + 2^2 = r^2$$

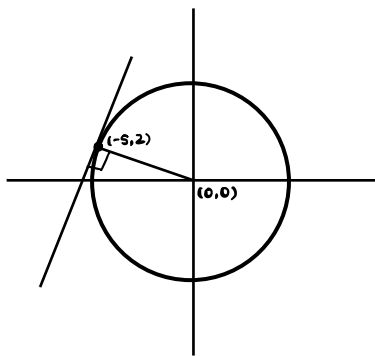
$$25 + 4 = r^2$$

$$\underline{\underline{29 = r^2}}$$

$$\boxed{x^2 + y^2 = 29}$$

(a) $x^2 + y^2 = 29$ [4]

(b) (b) Work out the gradient of the tangent to the circle at $(-5, 2)$.



gradient of radius: $\frac{\Delta y}{\Delta x} = G$
 $\frac{2-0}{-5-0} = -\frac{2}{5}$

since perpendicular with radius ...
tangent gradient is $\frac{5}{2}$

$$(m \rightarrow -\frac{1}{m})$$

(b) $\frac{5}{2}$ [2]

Total Marks for Question Set 1: 50

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