1) Every flip of a coin is independent of the other flips. Therefore what you got in the previous ~~flip~~ flips is not going to affect what you will get next.

Therefore the answer is (C).

2) The probability that a child posses the trait is 25%. Therefore out of 4 children, we can expect one child to have the trait.

However, probability talks about something that is likely to happen. Not ~~something~~ about something that should or must happen.

Therefore the answer is (B).

3) For one play, the probability of ~~getting~~ guessing it right is $\frac{1}{4}$, (Each play is independent).
Therefore, out of 20 plays, we can expect 5 correct guesses.

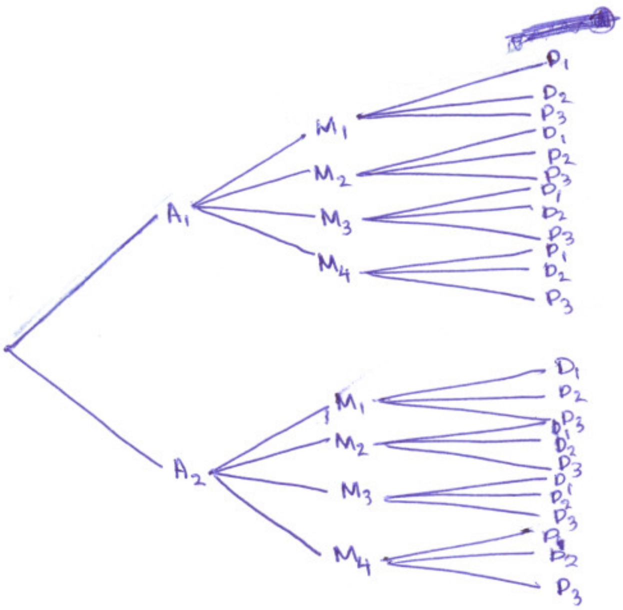
$\left(20 \cdot \frac{1}{4}\right)$

Therefore, the answer is (B)

4) Two trials are <u>independent</u> is one does not affect the other.
Two trials are <u>disjoint</u> if they have no common outcomes. (They cannot happen together)

Therefore, the answer is false. (A).

5)

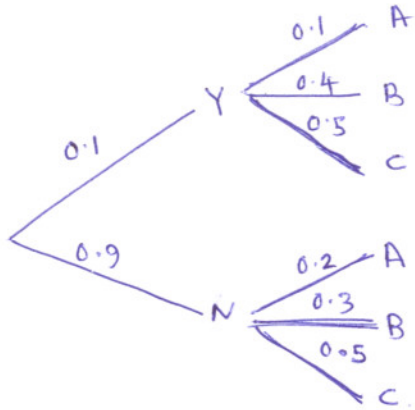


The question is basically asking for the number of outcomes.

Therefore the answer is (C)

(There are 24 outcomes).

6)



	Probability
YA	$(0.1)(0.1) = 0.01$
YB	$(0.1)(0.4) = 0.04$
YC	$(0.1)(0.5) = 0.05$
NA	$(0.9)(0.2) = 0.18$
NB	$(0.9)(0.3) = 0.27$
NC	$(0.9)(0.5) = 0.45$

Therefore, the probability of YB is 0.04.

The answer is (D)

7) Refer to the above tree diagram.

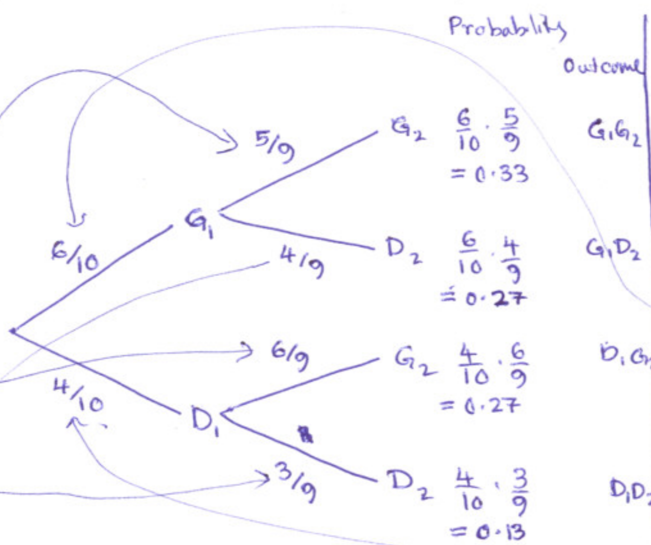
The event of answering 'B' = {YB, NB}.

(A)

Therefore probability of answering 'B' $= 0.04 + 0.27$

$= 0.31$

8)



- 6 - good 4 - defective without replacement.

Probability of getting a good one in the first draw $= \frac{6}{10}$ ← 6 good ← 10 total.

Therefore $P(G_1) = \frac{6}{10}$

- Probability of getting a defective one in the first draw $= \frac{4}{10}$ ← 4 defective ← 10 total.

- Probability of getting a good one in the second draw given the first one was good.
  i.e. $P(G_2 | G_1) = \frac{5}{9}$ ← 5 remaining good ← 9 total.
- Probability of getting a defective one in the second draw given the first one was ~~defective~~ good
  i.e. $P(D_2 | G_1) = \frac{4}{9}$ ← there are still 4 defective ← 9 total.
- Probability of getting a good one in the second draw given the first was defective.
  i.e. $P(G_2 | D_1) = \frac{6}{9}$ ← there are still 6 good. ← 9 total
- Probability of getting a defective one in the second draw given the first was defective.
  i.e. $P(D_2 | D_1) = \frac{3}{9}$ ← 3 remaining defective ← 9 total.

Therefore, the answer is (D).

9) We are recording the number of days that it snows in Cleveland in January.
The possibilities are, it could snow 0 days

it could snow 1 day

⋮

it could snow 31 days.

Therefore the sample space $= \{0, 1, \cdots, 31\}$.

Therefore, the answer is (A).

10). A student is taking two pass/fail courses over the summer break.
The possibilities are

$\{PP, PF, FP, FF\}$

Passing both

passing first, failing the second,

failing the first, passing second

failing both

Therefore ~~answer~~ the answer is (A)

11)

HHHH	HHHT	HHTH	HHTT
HTHH	HTHT	HTTH	HTTT
THHH	THHT	THTH	THTT
TTHH	TTHT	TTTH	TTTT

The circled ones have exactly three tails.

~~Therefore, the probability is~~

Therefore, the event of getting exactly 3-tails $\} = \{HTTT, THTT, TTHT, TTTH\}$.

The answer is (A).

12)

HHHH	HHHT	HHTH	HHTT
HTHH	HTHT	HTTH	HTTT
THHH	THHT	THTH	THTT
TTHH	TTHT	TTTH	TTTT

Therefore the event of obtaining the same face on the first three tosses

= {HHHH, HHHT, TTTH, TTTT}.

The answer is (D)

13)

ABC	ABD	ABE	ACD	ACE
ADE	BCD	BCE	BDE	CDE

X

X - event that both Bob and Dave are selected

X^c is everything except X.

therefore X^c = {ABC, ABE, ACD, ACE, ADE, BCE, CDE}

Therefore the answer is (A)

14) A - event that Betty and Allison are both selected

B - event that more than one man is selected.

(A) Yes. They are disjont. (Because is Allison and Betty are both selected, there is only place left for one more person. Therefore A and B cannot happen together).

15) No (A) They are not disjoint.

They are not disjoint due to the fact that a student taking exactly 9 hours belong to both A and B.

16) $P(M \text{ or } C) = P(M) + P(C) - P(M \text{ and } C)$. — Addition Rule

$0.524 = P(M) + 0.048 - 0.044$

$0.524 = P(M) + 0.004$

$0.52 = P(M)$

(A)

17) $P(M^c) = 1 - P(M)$ — complement rule.

$= 1 - 0.52$

$= 0.48$

(A)

18) $P((M \text{ and } C)^c) = 1 - P(M \text{ and } C)$

$= 1 - 0.044$

$= 0.956$

(D)

19) 7 out of 8 possible outcomes has at least one H.

Therefore the probability of getting at least one heads is = $\frac{7}{8}$

(E)

20)

(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

— ~~Same~~ Event of sum of the two dice = 7

Therefore the probability of the sum being 7

$= \frac{6}{36} = \frac{1}{6}$

(D)

21)

(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

– sum is 4

– sum is 12.

Therefore the probability of getting a sum 4 or 12 $= \frac{4}{36} = \frac{1}{9}$

(C)

22) Total number of people opposing death penalty = 599

Total " " " = 1858.

Therefore, the probability of a randomly chosen person opposing death penalty $\Big\} = \frac{599}{1858}$

$= 0.322$

(C)

23) Probability of a student being under 21 $= \frac{409}{1490}$

$= 0.274$

student being 21 or over = (student being under 21)^c

Therefore

P(student being 21 or over) = 1 − P(student being under 21)

$= 1 - 0.274$

$= 0.726$

(C)

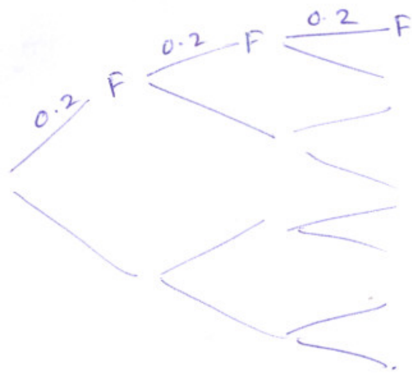
24) At least one light bulb lasting more than 900 = (all three fail before 900 hours)^c

Therefore

P(at least one lasting more than 900 hours) = 1 − P(FFF) (F − fail).

$P(FFF) = (0\cdot2)(0\cdot2)(0\cdot2)$

$= 0\cdot008$



Therefore

P(at least one lasting more than 900 hours) $= 1 - 0\cdot008$

$= 0\cdot992$

(C)

25) At least one bulb being pink = (all being red)^c

Therefore

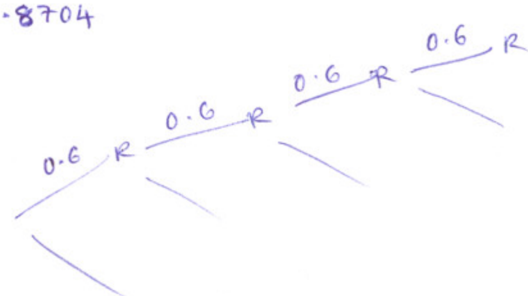
P(at least one bulb being pink) = 1 − P(RRRR)

$= 1 - (0\cdot6)^4$

$= 1 - 0\cdot1296$

$= 0\cdot8704$

(C)



26) 1 2 3 4 5 6

$= \frac{2}{6} = \frac{1}{3}$

(D)

27) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

$= \frac{7}{15}$ (You don't count the same element twice).

(B)

28) F_G - ~~favo~~ Event of favoring gun law
F_D - Event of favoring death panelty.

The quenstion is asking

$P(F_G \text{ or } F_D)$.

The data gives $P(F_G) = 0.796$, ~~and~~ $P(F_D) = 0.678$

and $P(F_G \text{ and } F_D) = 0.527$

Using addition rule

$$P(F_G \text{ or } F_D) = P(F_G) + P(F_D) - P(F_G \text{ and } F_D)$$
$$= 0.796 + 0.678 - 0.527$$
$$= 0.947$$

(C)

29) B - taking blood pressure lowering medication
C - taking cholestarol lowering medication.

$P(B) = 0.52$ $P(C) = 0.43$ $P(B \text{ and } C) = 0.05$.

The question is asking for $P(B \text{ or } C)$.

$$P(B \text{ or } C) = P(B) + P(C) - P(B \text{ and } C)$$
$$= 0.52 + 0.43 - 0.05$$
$$= 0.90$$

(C)

30) $P(A) = 0.4$, $P(B) = 0.3$ and $P(A \text{ and } B) = 0$

- A and B are disjoint since $P(A \text{ and } B) = 0$.
- A and B are independent if $P(A \text{ and } B) = P(A) \cdot P(B)$.

  But $P(A) \cdot P(B) = (0.4)(0.3) = 0.12 \neq P(A \text{ and } B)$

  therefore A and B are not independent.

Therefore the answer is

(D)

31) $P(A) = 0.8$, $P(B) = 0.2$, $P(A \text{ and } B) = 0.16$

- A and B are disjoint if $P(A \text{ and } B) = 0$.

  But in this question $P(A \text{ and } B) = 0.16 \neq 0$

  therefore A and B are not disjoint.
- $P(A \text{ and } B) = 0.16$

  $P(A) \cdot P(B) = (0.8)(0.2) = 0.16$

  Therefore $P(A \text{ and } B) = P(A) \cdot P(B)$ and hence, A and B are independent.

Therefore the answer is (A)

32) (You can also do this using a tree diagram)

Because this is with replacement, drawing a white in the first chance and drawing a white in the second chance are independent.

Therefore $P(W_1 \text{ and } W_2) = P(W_1) \cdot P(W_2) = P(W)^2 = \left(\frac{1}{5}\right)^2 = \frac{1}{25} = 0.04$

(C)

(Probability of drawing a white $= \frac{10}{50} = \frac{1}{5}$)

33) (This also can be done using a tree diagram).

D - drinker
N - non drinker

E - at least one of the two being a drinker. $E = (NN)^c$

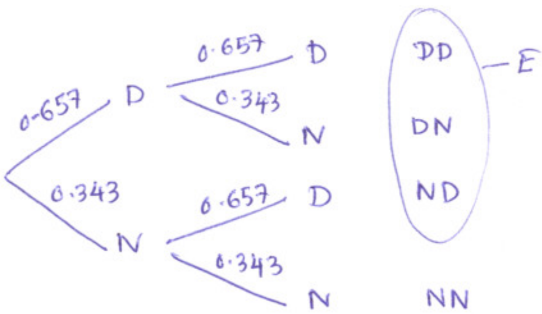
Therefore $P(E) = P((NN)^c) = 1 - P(NN)$.

But the first person being a drinker or nondrinker does not have any affect on the second person being a drinker or not. Therefore they are independent events.

Therefore $P(NN) = P(N) \cdot P(N)$. but $P(N) = 1 - P(D) = 1 - 0.657 = 0.343$.

Therefore $P(NN) = (0.343)^2 = 0.118$. Therefore $P(E) = 1 - 0.118 = 0.88$ (B)

Using the tree diagram



$P(E) = 1 - P(NN)$

$= 1 - (0.343)(0.343)$

$= 0.88.$

34) M – respondent being male. F – respondent favoring sex education.

$P(M) = 0.44 \qquad P(F) = 0.89$

The question is asking for $P(M \text{ or } F)$.

Using addition rule,

$$P(M \text{ or } F) = \underset{\checkmark}{P(M)} + \underset{\checkmark}{P(F)} - \underbrace{P(M \text{ and } F)}_{\text{still unknown.}} \quad \text{—} (1)$$

But it is given that M and F are independent.

Therefore $P(M \text{ and } F) = P(M) \cdot P(F)$

$= (0.44)(0.89) = 0.3916$

Therefore using equation (1)

$P(M \text{ or } F) = 0.44 + 0.89 - 0.3916$

$= 0.9384.$

(A)

35) H - having high blood pressure
M - male
F - female.

$P(H|M) = \frac{17}{87} = 0.195$ ← 17 out of 87 men have high blood pressure

$P(H|F) = \frac{20}{88} = 0.227$ ← 20 out of 88 women have high blood pressure.

$P(H) = \frac{17+20}{87+88} = \frac{37}{175} = 0.211$ ← 37 out of 175 people have high blood pressure.

A) doesn't make sense.

B) $P(H|M) \neq 0.227$. therefore wrong

c) doesn't make sense.

D) $P(H|F) \neq 0.211$ and $P(H|M) \neq 0.211$ therefore wrong.

E) $P(H|F) = 0.227$ $P(H) = 0.211$

If H and gender were independent $P(H|F) = P(H)$
therefore H and F are not independent

Therefore (E) is the correct answer.

36) H - high blood pressure W - woman.

$P(H|W) = \frac{18}{81} = 0.222$ ← 18 out of 81 women have high blood pressure.

(A)

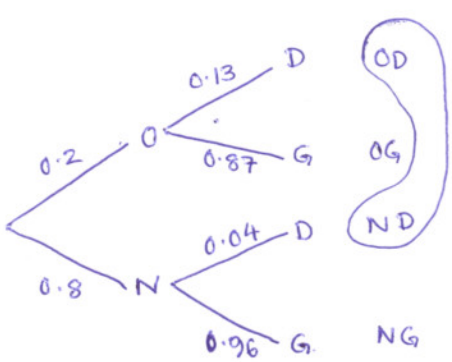
37)

D - democrat O - oppose strong gun control law.

~~P(O|D)~~ The question is asking for $P(O|D)$ (Conditional probability)

$P(O|D) = \frac{P(O \text{ and } D)}{P(D)} = \frac{0.16}{0.25+0.16} = \frac{0.16}{0.41} = 0.390$ (C).

38)



Given $P(D|O) = 0.13$ $P(D|N) = 0.04$.

~~Old machine produces~~

The new machine produces 4 times faster than the old machine

~~Therefore if you take 5 products 4 will be the~~

$O:N = 1:4$. Therefore 4 out of 5 are from the new machine whereas 1 out of 5 will be from old.

therefore $P(O) = \frac{1}{5} = 0.2$ and $P(N) = 0.8$

The question is asking for the probability of $\{OD, ND\}$.

$= P(OD) + P(ND) = (0.2)(0.13) + (0.8)(0.04) = 0.026 + 0.032 = 0.058$.

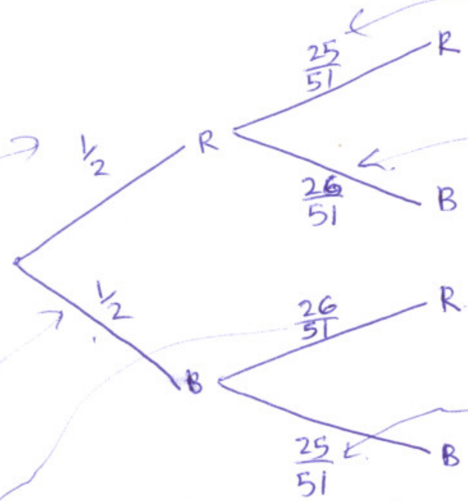
39) Refer to the previous question's tree diagram.

This question is asking for the probability of O|D (Conditional probability).

$$P(O|D) = \frac{P(O \text{ and } D)}{P(D)} = \frac{P(OD)}{P(D)} = \frac{(0.2)(0.13)}{0.058} = 0.448.$$

From question (38)

40). Drawing two cards out of a deck of 52.



In the first draw 26 - black 26 - red total 52.

Therefore

$P(R) = \frac{26}{52} = \frac{1}{2}$ $P(B) = \frac{26}{52} = \frac{1}{2}$.

If the first was red, now 25 - red 26 - black 51 - total

Therefore $P(R|R) = \frac{25}{51}$ $P(B|R) = \frac{26}{51}$

If the first was black, now 26 - red 25 - black 51 - total

therefore $P(R|B) = \frac{26}{51}$ $P(B|B) = \frac{25}{51}$.

Therefore the answer is (B)