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Solution Bank 6.2

① a) Yes - all binomial conditions met
b) NO - not a fixed number of trials
c) NO - not a fixed probability of success
d) Yes - fixed number of independent trials, 2 possible outcomes and fixed probability of success

② a) $P(X=2) = \binom{6}{2}(0.2)^2(0.8)^4$
$= 15 \times 0.04 \times 0.4096$
$= 0.24576$

b) $P(1) = \binom{6}{1}(0.2)^1(0.8)^5 = 6 \times 0.2 = 0.32768$
$= 0.3932$
0.01536

c) $0.2621 + 0.3932$
$= 0.65536$

③ a) $P(Y=6)$
$\binom{12}{6}(0.3)^6(0.7)^6$
$= 924 \times 0.000729 \times 0.117649$
$= 0.1766$

b) $P(Y<2) = P(0) + P(1)$
$P(Y<2) = 0.0684$

c) $P(Y \geq 9) = 1 - P(Y \leq 8)$
$= 0.2253$

④ a) 8 independant trials $n=8$
$p = \frac{4}{5} = 0.8$
$n=8 \quad p=0.8$

b) i) $P(X=5)$
$\binom{8}{5}(0.4)^5(0.6)^3$
$= 56 \times 0.01024 \times 0.216$
$= 0.1468$

$P(X=3)$
$= 0.0092$
$P(X \geq 7) = P(7) + P(8)$
$= 0.5033$

⑤ a) the lifetimes are independant of each other, there are fixed number of trials, and the probability a battery lasts < 30hrs is constant

b) $P(X=3) = 0.2242$

c) $P(X \leq 2) = 0.5631$

⑥ a) P(likes chocolate) = 0.8
$X \sim B(50, 0.8)$

b) i) $P(X = 40)$
$P(X=40) = 0.1398$

ii) $P(X > 47)$
$= 1 - P(X \leq 47)$
$= 0.013$

⑦ a) Prime numbers → 2, 3, 5
probability of success $= 3/6 = 0.5$
$X \sim B(10, 0.5)$
the rolls are independant of each other; the probability of rolling a prime number is constant

b) $P(X=4)$
$P(X=4) = 0.2051$

c) P(success) = 0.2051
$Y \sim B(7, 0.2051)$
Find $P(Y=2)$
$= \binom{7}{2}0.2051)^2(1-0.2051)^5$
$= 21 \times 0.0420 \times 0.3276$
$= 0.2803$